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COUNTRY	USSR (Abkhaz SSR)	REPORT		
SUBJECT	Development of Barrier for Gaseous Diffusion in Sinop from 1946 to 1952	DATE DISTR.	20 Februa	y 1957
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DATE OF		REFERENCES		25X1
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COUNTRY	USSR (A	okhasskaya ASSR	;	DATE DISTR	·11 Jan 57
SUBJECT	Develor	ent of Barrier	for Gaseous	NO. OF PAG	
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TIME TABLE FOR GASEOUS DIFFUSION BARRIER DEVELOPMENT IN SINOP

Various Preliminary Attempts at Barrier Development.

Development of Methods for Producing Nickel Powder.

Development of Standard Thiessen Barrier.

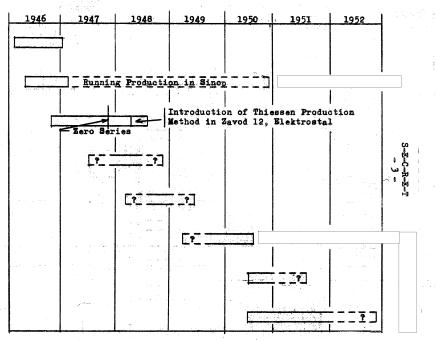
Statistical Survey to Determine Optimum Industrial Regimen.

New Methods for Barrier Manufacture. (Burdiashvili/Ziehl).

Passivation and Corrosion Studies.

Automation of Standard Thiessen Barrier. (Rudanovskiy).

Salvaging of Rejected Production Barriers.



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	THE CONTRACT OF		
	INTRODUCTION	A STATE OF THE STA	
ı.			25X
2.	Until 1952, the highest authority of the combined S	inop and Agudzeri	
	institutes was Gen. Aleksandr Ivanovich Kochlavashv	ili, who was	
	succeeded for a short time in 1952 by Col. Lordkipa time in 1952, this office was abolished.	nidze (mu); some-	25X1
	Kochlavashvili's official title was Plenipotentiary		
	Ministers. He appeared to act as liaison between S supervising echelon in Moscow, as well as between A		
	When the Sinop and Agudzeri institutes were combine	d in 1950, the first	
	director of the combined institutes was Vladimir Va a physics professor from Moscow University. Most o		
	sections in Agudzeri were moved to Sinop, and only	branch administrative	
	offices were maintained in Agudzeri; administration deputy for administration, Petr Varlam ovich Chelid	ze. The scientific	
	technical offices in Agudzeri and Sinop were under technical matters, Boris Mikhaylovich Isayev (First	two deputies for	
	in Sinop and Ilin Filippovich Kvartskhava (Second D		
	Agudari. The divisions of responsibility between technical directors was not made on the basis of ge		
	location alone. Kvartskhava was responsible for so	me departments in	• •
	Agudzeri but also for at least one department in Si Thiessen department. Likewise, the department of W	nop, viz., the	
	Agudzeri was not responsible to Kvartskhava but to	Isayev who had his	
	office in Sinop. Evidently the division between the on the basis of scientific fields, with Kvartskhava	e two deputies was	
	ments with an emphasis on chemical science, whereas	Isayev supervised	
	departments with a primary emphasis on physics.		
	ODG ART 7 ART COL OR WITH WITH DECIDED PRODUCE TO CALL OR	0.7070	
	ORGANIZATION OF THE THIESSEN DEPARTMENT FROM 1946 T	0 1952	
3.	The work of setting up Sinop Institute and the Thie		
	began in fall 1945 and continued through spring 194 however, had already begun minor research tasks.	O. A lew Germans,	
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			•
L		1, 1, 2, 3, 1	
	And the second of the second o		
			25X1
			20/(1

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S-E-C-R-E-T

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	S=E=C=T ==5=	
	∞)∞ ∶	
On 10 May	1946, 2 conferences took place in Sinop at which each depart-	
ment, i.e	., that of Thiessen, Max Steenbeck, and Manfred von Ardenne,	
waa given	its assignment for the next years.	25
Aem P	TOO COOLEGIERON TON MICH STORY OF THE STORY	۷.
	——————————————————————————————————————	
	ding Soviet scientists participated in these conferences. They	
had been	in Sinop for some time in 1946, and had assisted the three	
German de	partment chiefs in setting up the institute.	25)
· · · · · · · · · · · · · · · · · · ·	the name of the scientist who assisted von Ardenne, viz.,	
	yevich (fnu). the scientist who assisted	
	was elderly, was balding, and had one or two prominent swellings	
on his he	ad.	
. a nagi	tive incentive, the Germans were shown a table on which a pre-	
ya a hoor	ward was listed for each task. It was during one of these	
	es that the Thiessen department was given the project of	
	g barriers for gaseous diffusion.	25X
40 +0±0p==-,	7 pattrate for Eccando official	ZU)
	sen department worked on the barrier project from 1946 to 1952,	
although	the problem of producing a workable barrier had been essentially	
solved by	1948. During these years, the Thiessen department was organized	
	on the chart on page 6.	
Key to Ur	ganization Chart	
	F:	
		25)
		25)
	The function of the	25)
	ections during the different periods will be tabulated below.	25)
The person	ections during the different periods will be tabulated below. nnel have been listed by numbers: the numbers 1 to 32 apply	25)
The person to German	ections during the different periods will be tabulated below. nnel have been listed by numbers: the numbers 1 to 32 apply nationals; the numbers 50 and higher apply to Soviet nationals;	25)
The person to German	ections during the different periods will be tabulated below. nnel have been listed by numbers: the numbers 1 to 32 apply	25)
The person to German	ections during the different periods will be tabulated below. nnel have been listed by numbers: the numbers 1 to 32 apply nationals; the numbers 50 and higher apply to Soviet nationals; sk beside a number indicates the head of the section.	25)
The person to German	ections during the different periods will be tabulated below. nnel have been listed by numbers: the numbers 1 to 32 apply nationals; the numbers 50 and higher apply to Soviet nationals; sk beside a number indicates the head of the section.	25
The person to German an asteri:	ections during the different periods will be tabulated below. nnel have been listed by numbers: the numbers 1 to 32 apply nationals; the numbers 50 and higher apply to Soviet nationals; sk beside a number indicates the head of the section. [numbers refer to the organizational chart on page 67]	
The person to German an asteria Personnel	ections during the different periods will be tabulated below. nnel have been listed by numbers: the numbers 1 to 32 apply nationals; the numbers 50 and higher apply to Soviet nationals; sk beside a number indicates the head of the section.	25X
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The person to German an asteria Personnel	ections during the different periods will be tabulated below. Innel have been listed by numbers: the numbers 1 to 32 apply nationals; the numbers 50 and higher apply to Soviet nationals; sk beside a number indicates the head of the section. Inumbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt	
The person to German an asteria Personnel	ections during the different periods will be tabulated below. Innel have been listed by numbers: the numbers 1 to 32 apply nationals; the numbers 50 and higher apply to Soviet nationals; sk beside a number indicates the head of the section. Inumbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell	
The person to German an asteria Personnel	ections during the different periods will be tabulated below. In the number of the numbers of the numbers of the numbers of the numbers of the number of the section. In the number of the enganizational chart on page of the number of the section. Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell Ludwig Albert Wilhelm Ziehl	
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The person to German an asterial Personnel 1 2 3 4 5 6 7 8	ections during the different periods will be tabulated below. Innel have been listed by numbers: the numbers 1 to 32 apply Inationals; the numbers 50 and higher apply to Soviet nationals; Insk beside a number indicates the head of the section. Inumbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell Ludwig Albert Wilhelm Ziehl Wilhelm Willid Lange Erich Wilhelm Franke Wolfgang Friedrich Srocke	
The person to German an asterial Personnel 1 2 3 4 5 6 7 8 9	ections during the different periods will be tabulated below. Innel have been listed by numbers: the numbers 1 to 32 apply Inationals; the numbers 50 and higher apply to Soviet nationals; Insk beside a number indicates the head of the section. Inumbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell Ludwig Albert Wilhelm Ziehl Wilhelm Willi Lange Erich Wilhelm Franke Wolfgang Friedrich Srocke Werner Siegling	
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The person to German an asterial Personnel 1 2 3 4 5 6 7 8 9	ections during the different periods will be tabulated below. Innel have been listed by numbers: the numbers 1 to 32 apply Inationals; the numbers 50 and higher apply to Soviet nationals; Insk beside a number indicates the head of the section. Inumbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell Ludwig Albert Wilhelm Ziehl Wilhelm Willi Lange Erich Wilhelm Franke Wolfgang Friedrich Srocke Werner Siegling	
The person to German an asterial Personnel 1 2 3 4 5 6 7 8 9 10	ections during the different periods will be tabulated below. Innel have been listed by numbers: the numbers 1 to 32 apply Inationals; the numbers 50 and higher apply to Soviet nationals; Insk beside a number indicates the head of the section. Inumbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell Ludwig Albert Wilhelm Ziehl Wilhelm Willij Lange Erich Wilhelm Franke Wolfgang Friedrich Srocke Werner Siegling Kurt Heptner	
The person to German an asterial Personnel 1 2 3 4 5 6 7 8 9 10	ections during the different periods will be tabulated below. Innel have been listed by numbers: the numbers 1 to 32 apply Inationals; the numbers 50 and higher apply to Soviet nationals; Insk beside a number indicates the head of the section. Inumbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell Ludwig Albert Wilhelm Ziehl Wilhelm Willij Lange Erich Wilhelm Franke Wolfgang Friedrich Srocke Werner Siegling Kurt Heptner	
The person to German an asterial Personnel 1 2 3 4 5 6 7 8 9 10 11	ections during the different periods will be tabulated below. Innel have been listed by numbers: the numbers 1 to 32 apply Inationals; the numbers 50 and higher apply to Soviet nationals; In sk beside a number indicates the head of the section. In umbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell Ludwig Albert Wilhelm Ziehl Wilhelm Willing Langer Erich Wilhelm Franke Wolfgang Friedrich Srocke Werner Siegling Kurt Heptner Irmgard Schumacher (nee Striepling)	25X
The person to German an asteria Personnel 1 2 3 4 5 6 7 8 9 10 11	ections during the different periods will be tabulated below. Innel have been listed by numbers: the numbers 1 to 32 apply Inationals; the numbers 50 and higher apply to Soviet nationals; In sk beside a number indicates the head of the section. In umbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell Ludwig Albert Wilhelm Ziehl Wilhelm Willi Lange Erich Wilhelm Franke Wolfgang Friedrich Srocke Werner Siegling Kurt Heptner Irmgard Schumacher (nee Striepling) The section of the organization of	25X
The person to German an asteria Personnel 1 2 3 4 5 6 7 8 9 10 11	ections during the different periods will be tabulated below. Innel have been listed by numbers: the numbers 1 to 32 apply Inationals; the numbers 50 and higher apply to Soviet nationals; In sk beside a number indicates the head of the section. In umbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell Ludwig Albert Wilhelm Ziehl Wilhelm Willing Langer Erich Wilhelm Franke Wolfgang Friedrich Srocke Werner Siegling Kurt Heptner Irmgard Schumacher (nee Striepling)	25X
The person to German an asteria Personnel 1 2 3 4 5 6 7 8 9 10 11	ections during the different periods will be tabulated below. Innel have been listed by numbers: the numbers 1 to 32 apply Inationals; the numbers 50 and higher apply to Soviet nationals; In sk beside a number indicates the head of the section. In umbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell Ludwig Albert Wilhelm Ziehl Wilhelm Willi Lange Erich Wilhelm Franke Wolfgang Friedrich Srocke Werner Siegling Kurt Heptner Irmgard Schumacher (nee Striepling) The section of the organization of	25X
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2 End-1946 16*,51,21, 68 5*,26,15	3 1947/48- 1948/49 51*,21,68, /// 5*,12,13, 14,19,20, 23,24,25, 52,55,56, 57,60,61, 8,9,15,26	///	63*,67,64 54*,55,25,
16*,51,21, 68 5*,26,15	51*,21,68, /// 5*,12,13, 14,19,20, 23,24,25, 52,55,56, 57,60,61, 8,9,15,26	51*,21,68, /// 5*,54,55, 25,58,56, 57,10,23, 24,26	51*,68 63*,67,64 54*,55,25, 10,57, 5, 58,59,60
5*,26,15	5#,12,13, 14,19,20, 23,24,25, 52,55,56, 57,60,61, 8,9,15,26	/// 5*,54,55, 25,58,56, 57,10,23, 24,26	63*,67,64 54*,55,25, 10,57, 5, 58,59,60
///	5*,12,13, 14,19,20, 23,24,25, 52,55,56, 57,60,61, 8,9,15,26	5*,54,55, 25,58,56, 57,10,23, 24,26	54*,55,25, 10,57, 5, 58,59,60
	14,19,20, 23,24,25, 52,55,56, 57,60,61, 8,9,15,26	25,58,56, 57,10,23, 24,26	10,57, 5, 58,59,60
6,11	22*, ?	22*,26	22*,26
1*,12,13, 14,	///	1*,13	1*,13
4*,18,19 20	4*,18	4*,18	4*, 9
3*,7,10, 64	3*,10,27, 65,66	3*,27,7, 31,32	3*,7,27,
2*,52,53, 26,55,31, 32	62*,31,32	62*,61,52	62*,61,52
		9.0	8 -2012
	2*,52,53, 26,55,31, 32	64 65,66 2*,52,53, 26,55,31, 32	2*,52,53, 62*,31,32 62*,61,52 26,55,31,

ORGANIZATION CHART OF THIESSEN DEPARTMENT

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Susanne Srocke (nee Kittan)
12
13
14
             Ingrid Schilling
             Martin Krecker
15
             Karl Urban Melcher
             Juergen Artur Ziegler
16
17
             Horst Paul Schnaase
18
             Waldemar von Maydell
             Schulze (fnu) **
Heinrich Matthias Eulen
19
20
21
             Eduard Schmitz
22
             Walter Hartz
23
24
             Gustav Karl Fliegner
             Kurt Panten
Helmut Hepp 9a/
25
26
             Dorothea Thiessen
27
             Margarete Susu Devrient
28
             Dr. Ernst Emil Rexer
29
             Fritz Engelhardt
30
31
             Heinz Rackwitz
             Dr. Heinz Karl Moehr
32
             Dr. Wolfgang Gramberg
             Aksyanov (fnu)
Burdiashvili, Shaley Savovich
Lomadze, Æteri
50
51
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59
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62
63
64
66
66
66
67
68
             unidentified
             Prokudin, Ivan Petrovich
             Yelkin (fnu)
             Gorizontov, Boris Arkadyevich Toshchev (fnu)
Listopad (fnu - husband)
             Listopada (fnu - wife)
             Suslenikova, Vera Mikhaylovna
             Frolova (fnu)
             Sokolova (fnu)
             Rudanovskiy (fnu)
             Oziashchvili, Edika
             unidentified
             unidentified
             unidentified
             Shamba, Nadezhda Alekseyevna
69
             Assotiani, Yasha Rademovich
70
71
             Skiriya (fnu)
             Fursa (fnu)
72
             unidentified
73
             Tsomaya (fnu)
74
             Kirvalidze (fnu)
             Mitrenin, Boris Petrovich
```

25X1

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Functions of Sections

9. Each section of the Thiessen department is identified by a letter from A to I. The various periods shown on the organizational chart are identified by digits from 1 to 5. For example, the code A - 3 refers to Metallurgical Laboratory I during the period 1947/1948 to 1948/1949:

For convenience, the sections and time periods are listed again:

- A Metallurgical Laboratory I
- B Metallurgical Laboratory II
- C Technological Section
- D Design Section
- E Thiessen's Laboratory
- F Physical Laboratory
- G X-Ray Laboratory
- H Chemical Laboratory
- I Workshops
- 1 mid-1946
- 2 end-1946

Water Date ...

- 3 1947/1948 1948/1949
- 4 1949 August 1950
- 5 August 1950-1952

Section A-1: Preliminary experiments for the manufacture of metal

diaphragms.

Section A-2: Manufacture of highly dispersed reduction powder

and powder mixtures.

Section A-3: Manufacture of diaphragms by means of sedimentation.

Section A-4: Continued development of diaphragms. Section A-5:

25X1

Section B-1:	Non-existent.
Section B-2:	Manufacture of nickel carbonyl powder.
Section B-3:	Non-existent.
Section B-4:	Non-existent.
Section B-5:	Continued development and automation of diaphragms.
Section C-1:	Non-existent.
Section C-2:	Non-existent.
Section C-3:	Manufacture, development, and automation of the production of Standard Thiessen Barrier.
Section C-4:	Corrosion and passivation studies on barriers.
Section C-5:	Continuation of experiments as in C-4 and determination of reaction speed of uranium hexafluoride and water.
Section D-1: to D-5	Prepared design and technical drawings for apparatuses required by all other sections of the Thiessen department.
Section E-1: E-2:	Development of diaphragms by means of press and spray methods.
Section E-3:	Non-existent.
Section E-4:)	Supervising other sections.
Section F-1:) to F-5:	a. Development of measuring apparatus for determining gamma and delta gamma over gamma of diaphragms.
	b. Development of apparatus for determining properties of metal powders by means of sedimentation.
	c. Development of high-frequency sintering apparatus for use in manufacture of barriers.
	d. Development of a separation stage for the determination of separation factor of diaphragms.

S-E-C-R-E-T

e. Measurement of the mechanical stability of diaphragms.

			S-E-C-R-E-T -10-	25X1
	Section G-1:) to G-5:	a.	Experiments for the manufacture of metal diaphragm by means of electrolysis.	s
		b.	Designing accessory calculating device (slide- rule) for use with Pechukas and Gage apparatus.	gi grap
		c.	Cathode dispersion and X-ray experiments.	
	Section H-1:)	a.	Inorganic analyses.	
	to H=3:	b.	Manufacture or organic barriers.	
		c.	Development of fluorine generators.	
		d.	Studies concerning $\rm H_{2}O$ evaporation and other distillation problems.	
•	Section H-4:)	Ans	lytical investigations.	
	Section I-1: to I-5:		formed precision machine work for all sections of Thiessen department.	
	Mitrenin Department	(19	52–1955)	
10.	was accompanied by	he f	en was transferred from Sinop to Elektrostal. He collowing Soviet members of his department:	
	Hermann Fritz Florel departed from Agudze	s al . A eri,	so accompanied by his German son-in-law t the same time Thiessen left Sinop, Yermin possibly to the same location as Thiessen. From Sinop all equipment and apparatuses which	25 X 1
	had been used for be			25 X 1
L				

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25X1 SECRET -11 -25X1 11. 12. At the time that Thiessen was transferred, Prokudin, a Soviet member of the Thiessen department who from 1950 to 1952 had been carrying made preparaout the corrosion experiments / 25X1 tions to transfer to an institute in Leningrad. All the corrosion equipment was crated and was sent away; but at the last minute Prokudin was ordered to remain behind in Sinop. 13. Upon the departure of Thiessen, the department was placed under the Soviet Mitrenin. As far as the German specialists were concerned, the date of Thiessen's transfer coincided with the end of classified work. The Soviets had gradually removed the Germans from key projects as early as mid-1950. 25X1 Classified work in the most extensive sense of the word, ended with the departure of Thiessen in fall 1952. The organization of the department of Mitrenin between fall 1952 and the time of the departure of the German specialists from Sinop in March 1955 was as follows: Personnel Section <u>Functions</u> 28*, 30, 29, 51, Metallurgical I Development of germanium and silicon monocrystals 5*, 25, 57, 69 Manufacture and determination of Motallurgical II properties of highly dispersed iron powder particles 74* and two uni-Determination of physical pro-Technology perties of semiconductors develdentified peroped in the Metallurgical I sons section 75* Design of apparatus required by Design Office other sections 4*, 9, 71 Physical Laboratory Working in cooperation with Metallurgical I, this section made sintering experiments with

S-E-C-R-E-T

germanium and silicon powders

	S-E-C-R-E-T - 12 -		25X1
	grand and the second se		
Ray Laboratory	X-ray studies, electron microscopy, and surface treatment of copper (electrolytic)	3*, 61, 72, 27, 7, 73, 64, 65	·
memical Laboratory	Analytical studies connected with distillation problems	2*, 54, 55, 62	
rkshop	Prepared precision machine work for the entire department	8	
Notes on Soviet	Personnel		
connected with	the Thiessen department	Soviet personnel	25X1
Aksyanov (fnu)	possibly should be Aksyantsov7		
Assigned to Met for manufacture	allurgical Laboratory of Thiessen Department of sintering material.	artment; responsible	
and of a sum of the second second			
Assotiani, Yash	a Rademovich		25 X 1
Burdiashvili, S	haley Sayovich		
Senior Scientif	+		
Senior Scientii	IC ASSOCIACE.		25X1
Same of the second			
Frolova (fnu),	Mrs.		
Assigned to the the Thiessen de	fluorine analysis project in the cher partment.	nical laboratory of	
Gorizontov, /Bo	ris Arkadyevic <u>h</u> 7		
<u>Kirvalidze</u> (fnu)		25X1
Kandidat nauk he was in Sinop	as Senior Scientific Associate in Mi	trenin's laboratory;	

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25X1 SEFECER FET - 15 -PRELIMINARY RESEARCH ON DIFFUSION BARRIERS IN SINOP 15. 25X1 16. No concrete technical requirements were announced by Thiessen in respect to the porous material, nor did he specify the type of 25X1 material that was to be used. the leading members of the Thiessen group each chose or were assigned a method for development for which they were best qualified based on their predilection or past experience: Siewert: manufacture of organic diaphragms. Wittstadt: manufacture of metal foils by an electrolytic process Thiessen: pressed metal powder diaphragms. Aksyanov (Soviet): manufacture of metal (probably copper) diaphragms. Bartell: development of measuring apparatus to measure the porous materials produced by the separate sections; he first used the pressure-equalization method. It was not until the end of 1946 that the technical requirements in the form of gamma and delta gamma over gamma specifications were made available. These were: gamma (permeability) equal to 0.8 to 1.2 x 10-3 and delta gamma over gamma (change in permeability) less than three percent. The delta gamma over gamma value was specified over a range from 15 to 65 mm of mercury. These requirements did not yet state that the diaphragms had to be metal, but simply specified "stability in respect to uranium hexafluoride." 25X1 this late 1946 definition of barrier properties in terms of gamma and delta gamma over gamma did not have any effect on the preliminary program which had been started in May 1946. A few weeks later (end 1946 to beginning 1947), however, Lt. Gen. Avraamiy Pavlovich Zavenyagin visited the Thiessen Department in

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organic diaphragms. That is, they were to continue to make the porous dia-

Sinop and ordered that metal diaphragms be given preference over

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n's work was the most	since May 1946.	·
sections using metallume organic diaphragms we	rt's organic work rgical approaches. ould have been	25)
chilling, and Martin led metal-powder diaphrage for this purpose a modi	Krecker, gms by means of ified German press,	
dropped. Burdiashvili	and Ziegler began	
by the reduction method	od.	25
of measuring equipment the electrolytic process	and the develop- ss, respectively.	
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ory diaphragms by means	of the pressing	- ,
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	sections using metallume organic diaphragms was time, as Siewert and ory, with his assistants whilling, and /Martin/ led metal-powder diaphrag for this purpose a modern of the purpose a modern of the section of the section method of the section method of the section of the se	Siewert's organic work sections using metallurgical approaches. he organic diaphragms would have been is time, as Siewert and Thiessen had a cry, with his assistants, Miss Kittan shilling, and Martin Krecker, and metal-powder diaphragms by means of for this purpose a modified German press, which had been used during the war to maized. Soon not only Siewert's project but dropped. Burdiashvilli and Ziegler began by the reduction method. Littstadt continued with their old projects, of measuring equipment and the developthe electrolytic process, respectively. Thiessen department which lasted into

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	STANDARD THIESSEN PRODUCTION BARRIER	
	機能が出来る。「日本の日本の日本の日本の日本の日本の日本の日本の日本の日本の日本の日本の日本の日	
	General Description	
•	At about the time (spring 1947) that the first pressed diaphragms were manufactured with nickel powder obtained from nickel carbonyl, the	
	Thiessen department received additional technical specifications	
	which included the required exterior dimensions for the barrier.	25)
	Since these larger dimensions could not be obtained by the pressing method, Thiessen turned to producing barriers by a	
	spraying process. Throughout 1947 and the early part of 1948, countless experiments were made in connection with this development until the	
	optimum regimen was finally determined. It is very likely that sample	
	barriers produced by the spraying method and representing the status	25)
	barriers produced by the spraying method and representing the status of development as of a given time were sent outside Sinop for inspection. Sometime around 19h7/19h8.	25)
	barriers produced by the spraying method and representing the status of development as of a given time were sent outside Sinop for inspection.	
	of development as of a given time were sent outside Sinop for inspection. Sometime around 1947/1948, the order came for the production of 300 to 400 barriers by the spraying	
	of development as of a given time were sent outside Sinop for inspection. Sometime around 1947/1948, the order came for the production of 300 to 400 barriers by the spraying	
	of development as of a given time were sent outside Sinop for inspection. Sometime around 1947/1948, the order came for the production of 300 to 400 barriers by the spraying	
	of development as of a given time were sent outside Sinop for inspection. Sometime around 1947/1948, the order came for the production of 300 to 400 barriers by the spraying	
	barriers produced by the spraying method and representing the status of development as of a given time were sent outside Sinop for inspection. Sometime around 1947/1948, the order came for the production of 300 to 400 barriers by the spraying method. After the development of the barrier proper in Sinop was completed, the	
-	barriers produced by the spraying method and representing the status of development as of a given time were sent outside Sinop for inspection. Sometime around 1947/1948, the order came for the production of 300 to 400 barriers by the spraying method.	25X 25X

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25X1

- 18 -27. Working on a 24 hour a day schedule, the production section of the Thieseen department turned out the 300 to 400 barriers, which constituted a zero or test series. 25X1 The barriers were individually wrapped in tissue paper and then placed in wooden boxes, each containing 100 barriers; wooden partitions formed sections holding 10 barriers each. Although throughout all of 1948, experiments were continued in the Thiessen department to improve the sprayed barrier /see pages 28-32 /, it was the barrier of this test series that was introduced into Zavod 12, Elektrostal, in June 1948. For this reason, it will be referred to in this report as the Standard Thiessen Barrier. 28. While the work to improve the barrier was in progress, occasional orders for additional series of the Standard Thiessen Barrier were received in Sinop. between 1948 and 1949. 25X1 at least three or four series of 1,000 barriers each were produced in Sinop. On each occasion, personnel who had meanwhile been assigned to help in other sections of the Thiessen department or had been working on small experimental series in connection with the improvements were conscripted and for a short while worked under great pressure on a 24 hour per day schedule. Again it should be noted that these were series of the Standard Thiessen Barrier as it existed in the beginning of 1948 and as it was introduced in June 1948 in Zavod 12, Elektrostal; these series were not affected by the experiments, then in progress, aimed at improving this barrier. 29. these production series were required to overcome critical needs of a cascade because of some mishap. 25X1 the barrier in a cascade could easily be made unserviceable by opening a wrong valve, permitting the pressure across the barrier to become too high and causing a collapse of the tube. 25X1 Flow Chart and Description of Production Steps 30. A flow chart identifying the thirteen separate steps in the production of the Standard Thiessen Barrier, as they were introduced in Zavod 12, Elektrostal, during the summer of 1948 is given below: Determination of nickel Cutting of wire screen powder properties (2) Preparation of the suspension (4)Electrolytic etching Spraying (6) Rolling Step No. 1 Sintering

25X1 S-E-C-R-E-T - 19 -(8) Rolling Step No. 2 (9) Cutting of the wire screen (10) Intermediate measurement (11) Welding of screen into tube (12) Weighing of finished barrier tube (13) Determination of permeability of barrier (gamma and delta gamma over gamma values) 31. Concerning these various production steps 25X1 Preparation of Wire Screen The wire screen used for the sprayed barrier in Sinop was supplied by an unidentified factory in East Germany. 25X1 Everything pertaining to the wire-screen material was considered a matter of security, and was therefore handled by the pervyy otdel or security department in Sinop. 25X1 In connection with occasional shortages of wire-screen material in Sinop,

Col. Mikhail Mikhaylovich

25X1

25X1

During the experiments leading to the final Standard Thiessen Barrier, diverse wire screens with anywhere from 5,000 to 20,000 mesh per square centimeter were used. It was found that the 5,000 mesh was too coarse and resulted in the sinter mass falling out, while the 20,000 mesh was considered too expensive. It was finally decided to use 10,000 mesh wire screen. The diameter of this wire was recalled to be about .05 mm with an unknown tolerance. After early experiments at cutting the wire in the direction of the mesh, it was later decided to cut the screen diagonally as this produced greater stability. The screen was cut into rectangular sections, 15 cm x 55 cm, which was sufficient for two finished tubular barriers when the sprayed screen was cut again (step 9) and welded (step 11).

Kuznetsov of the Ninth Directorate had once traveled to East

Germany in order to expedite shipment;

25X1

The rectangular section, 15 cm x 55 cm, was submerged in a bath of hydrochloric acid and was electrolytically etched so as to roughen the surface of the screen and to reduce its thickness. In arriving at a final specification for the etching phase, two diametrically opposed conditions had to be resolved; on the one hand, it was desirable to etch the wire to make it as thin as possible and, on the other hand, it was necessary to retain the stability of the wire screen. These experiments had been carried out in Wittstadt's laboratory, where two large rectifiers of 50 amperes each were available.

25X1

b. Spraying Operation

A suspension of nickel powder in ethyl alcohol was sprayed upon the etched and dried rectangular screen. The nickel powder used in the suspension was classified in terms of its shaking weight and shaking volume, and later a particle size which characterized the nickel powder was determined by the Pechukas and Gage test method.

25X1

c. Rolling, Sintering, and Welding Operations

After the suspension had been deposited on the etched wire screen, a few rolling passes were executed. The rollers used for this purpose were manufactured at Sinop but received their final machining in an unidentified plant in Tbilisi, as Sinop did not have any cylinder grinding machines. The number of passes for each rolling process was specified after experiments which determined how much rolling the mesh could safely stand and how much the volume available for sintered powder was decreased.

S=E=C=R=E=T		25
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,		
After the first rolling step, the screen was sintered, in a sintering oven, in a reducing atmosphere of hydrogen. the barrier was sintered for about one-half hour at a temperature of about 350°C 11	≨ . ù/	25
for about one-half hour at a temperature of about 350°C. 1	2 /	
Before the screen was welded, it was subjected to an intermediate measuring test. For this purpose a Gamma Zange or gamma forceps was designed, with which it was possible to make quick spot checks of the screen and determine whether the barrier had been damaged in production, i.e., large holes formed, etc.		1
The rectangular screen was then cut into two equal parts which were welded into tubes. The cutting was performed with a simple cutter similar to a photo laboratory papercutter. As stated above, the initial requirements were simply in terms of external dimensions for a flat-plate barrier. Sometime in 1947, the Thiessen department was ordered		25
After attempts to solder the nickel wire screen were unsuccessful, it was decided to weld the screen. For this purpose, an electric welding apparatus was designed with which the flat plates, produced in the manner described above, could be welded into tubes the decision to weld the flat plates was an internal one at		25X
Sinop, and that the Soviet order had simply called for tubes. The finished tube had a length of 500 mm and a diameter of 15 mm.	$+\sqrt{\gamma^2}$	
		25 X 1
		25X1
		25X′
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		25X ⁻

SE-C-RE-T

	S=E=C=R=E=T == 22 =		25X1
		and the second s	
End Pieces of Barrie	er.		
that the Standard Th	niessen Barrier product		25X′
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Measuring Operation	ia. 7		
development of porous began to design an a of this material. A which made use of a apparatus, however, particular, the deteinaccurate. In the was still making dissoviets supplied a F	partment first began to see material, Bartell an apparatus with which to the first, an apparatus pressure equalization did not supply accurate traination of the time beginning of 1947, at appragms by the pressing laechenmess apparate (fand probably also to A	d von Maydell test permeability was constructed method. This e data. In element was a time when Thiessen g process, the lat-plate measuring	
The prin	cipal reason for suppl te sure that the same m ts were used in other S	ying the measuring easurement criteria	25X1
			25X1
by approximately ten	-plate measuring appar etalon diaphragms. T ragms. The etalon dia	hese were standard	
nickel without wire- dimensions of 10 cm of the measuring app greater thickness th	screen support, and ha x 15 cm which was appr aratus. An etalon dia an the pressed diaphra	d exterior oximately the size phragm had a	
Thiessen and was ext	remely brittle.		25X
			25 X 1

S-E-C-R-E-T 25X1 - 23 -25X1 The Soviet measuring apparatus was used to measure the rectangular screens after the second rolling operation (step 8). Later, when the order for tubular barriers was issued, the Bartell section built another test apparatus making use of the same principles as the Soviet machine. Concerning the permeability_requirements of the barriers, it was already stated zee page 15 that the specifications were issued only towards the end of 1946. 25X1 The barriers produced in Sinopast the end of 1947 or the beginning and of 1948 satisfied the Soviet technical requirements: The rejectionati rate was negligible. The reason for this was that in the production series in Sinop each barrier could be treated individually, whichmas, ofecourse, not the case when the barrier was produced on an industrial scale. Later, when the production process was transferred from the Sinop

33.

S-E-C-R-E-T

the problem of rejects became significant / see pages 44-50/

than gamma values.

research institute to the Soviet barrier plant in Zavod 12, Elektrostal,

were the result of excessively high delta gamma over gamma values rather

practically all the rejects in the Soviet production plant

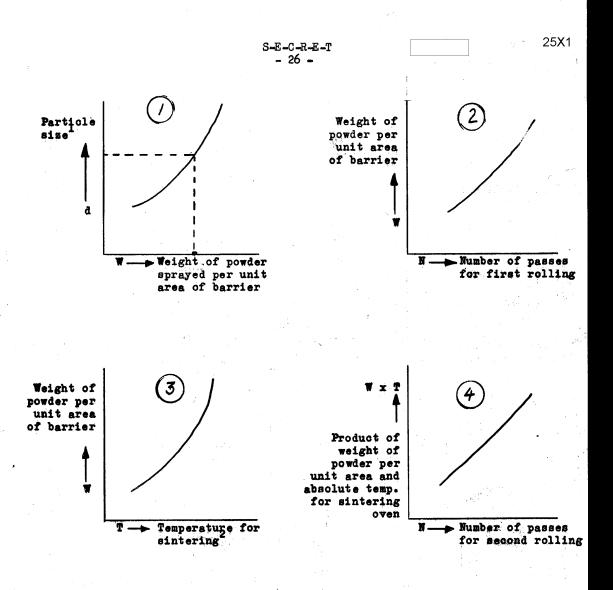
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35.				
				25X1
	STATISTICAL SURVEY TO DETERMINE OPTIMUM PRODUCTION REGIMEN			
36 .	Sometime in 1948, a statistical survey of the Thiessen barrier production regimen.			25X1
	The aim of the study was to determine the optimum regimen for obtaining barriers with specified gamma and delta gamma over gamma values for use in mass production. It was a rather crude analysis of data and not a real statistical analysis in the orthodox mathematical sense of the term.		1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	25X1
37•	For every barrier that was produced in Sinop during this time, including the production series as well as those barriers produced in connection with studies for improvement of the barrier, record was made. This information was prepared on cards]		25 X 1
	a. A number identifying the barrier			*

- b. Powder used:
 - (1) Nickel carbonyl, reduction, or Monel powder.
 - (2) Particle size of powder as determined by the Pechukas and Gage method.
- Quantity of powder per square centimeter sprayed on screen.
- d. Number of mesh per square centimeter of screen
- e. Etching treatment
- f. Number of passes during first rolling step
- g. Temperature and time of sintering
- h. Number of passes during second rolling step
- i. Thickness of finished barrier
- j. Weight of finished barrier
- k. Gamma and delta gamma over gamma values

25X1

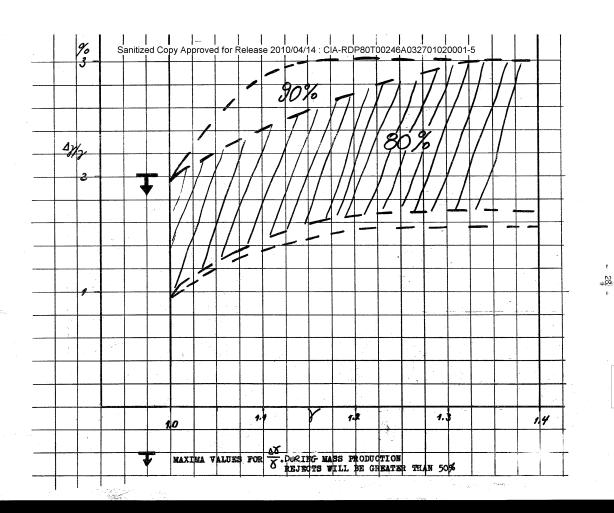
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38.	The information on the cards was plotted graphically in a great		
	number of ways. These graphs may be divided logically into two		
	series. The first series of graphs showed how the thickness,		
	final weight, and gamma and delta gamma-gamma values varied for		
	changes in parts of the production regimen. The second series,		
	which was produced after study of the first, showed the optimum		
	regimen to be used for the production of barriers which would meet		05)//
	the technical specifications for a given powder quality. this second series of curves was developed for the use	-6	25 X 1
	relatively unskilled technicians; it was to be used in the factory	OT	
	to determine the parameters for the production of the Standard		
	Thiessen Barrier.		
	4.	1	
39.			
			25X1
	· · · · · · · · · · · · · · · · · · ·		
10.	In graph 1 on page 26, the particle size of the powder as measured		
	by the Pechukas and Gage method is plotted against the optimum		
	weight of powder per unit area which should be sprayed on the scree	n	
	as the first step in the process to produce the Thiessen nickel-wir		
	mesh barrier which would meet the specifications.] .	25X1
	a second curve could be plotted on the same graph for use		20/(1
	with nickel powder manufactured by the reduction method.		
ı.	The number of passes to be specified for the first rolling process		<i>y</i>
11.	was determined from Graph 2 on page 26. The values on the ordinate		
	of this graph are identical with those on the abscissa of Graph 1.		
	On the second of		
12.		5	
	specified sintering time (one-half hour) was then determined from		
	Graph 3.		
	The number of neural neural de the neural neural de the		
13.	The number of passes required in the second rolling is given in Graph 4 on page 26.		
	Graph it on page 20.		,
4.	Similar graphs determined the current to be used in the etching		
	process and the nozzle diameter and powder-to-alcohol ratio in the		
	spraying process.		
15.	Over 90 percent of the barriers manufactured according to these		
	directions lay within the specified values for gamma and delta		
	gamma over gamma. For a specified range of gamma from 1.0 to 1.4 x	•	
	10 ⁻³ , the target value would be 1.2 x 10 ⁻³ , 17 In this case, over		
1 -	·		
			25 X 1



- Particle size as measured by the Pechukas and Gage method.
- The time of sintering was fixed at about one-half hour.

	S=E=C=R=E=T	25X1
	- 27 - - Company of the Company of	
	75 percent of the tubes would have gamma values between 1.1 and 1.3 x 10^{-3} , approximately 12 percent between 1.3 and 1.4 x 10^{-3} .	
46.		25X1
	evident that lower delta gamma over gamma values are associated with lower gamma values. With very strict control of the process it would be possible to manufacture the Standard Thiessen Barrier with a delta gamma over gamma of two percent over a range of gamma from 1.0 to 1.4 x 10 ⁻⁴ , if a rejec-	25X1
	tion rate of about 50 percent could be accepted. a lower delta gamma over gamma specification for tubes with an average gamma of 1.2 x 10 ⁻³ would be out of the question. None of the Standard Thiessen Barriers with gamma values of 1.0 x 10 ⁻³ or larger had a delta gamma over gamma of less than one percent.	25X1
	EXPERIMENTS TO IMPROVE BARRIER QUALITY	
47.	The Standard Thiessen Barrier had been successfully completed and the zero series approved by the beginning of 1948. During summer 1948, the manufacturing process for the Standard Thiessen Barrier was introduced into Zavod 12, Elektrostal, by a German group	
		25X
48.	Also during 1948 and 1949, the Thiessen department received orders for three or four series of the Standard Thiessen Barrier of 1,000 barriers each see page 18	
49.	In addition to these production efforts, the Thiessen department, in 1948 and 1949, was engaged in work aimed at modifying or improving the Standard Thiessen Barrier.	057/4
		25 X 1
50.	Most of the improvement work was a natural outgrowth of the barrier work that had been performed up to this time in Sinop, and the initiative was distinctly local. Within the framework of the Standard Thiessen Barrier project, it was hoped to simplify the technological production steps and also to improve the inherent characteristics of the barrier, such as the mechanical stability or the separation factor.	
51.	Some of the development tasks of this period were of a different nature. That is, the initiative came from outside Sinop.	25 X 1
		20/(1

ESTIMATE OF DELTA GAMMA OVER GAMMA DISTRIBUTION
IN PRODUCTION OF THIESSEN TUBULAR BARRIERS.



S-B-C-R-B-T

25X1

25X1

S.E.=C.R.E.T		25
10/		
Standard Thiessen Barrier was always used.		
		25 X 1
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	,	
Fahrstuhl. Two machines for treating barriers, makinuse of radio-frequency heating for sintering the barrier, were developed by Bartell and von Maydell. These machines were referred to as Fahrstühle (elevators), because the heating coil was moved swiftly over the vertically mounted barrier.	ng	21
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25X1 S-E-C-R-E-T - 31 -(4) Monel Powder. Ziegler developed a method to produce Monel powder by reduction. After Ziegler left Sinop in 1948, the experiments were continued by the Soviet 25X1 Monel was considered Burdiashvili as an alternate to nickel because this copper-nickel alloy is cheaper than nickel. 25X1 Variations of the Standard Thiessen Barrier Conic Barriers. The Thiessen department developed, presumably on the request of an unidentified installation outside Sinop, a sprayed barrier of conical shape. As the Thiessen department used the Standard Thiessen Barrier spraying process in this development, the task was simply and quickly accomplished. It was required only to design and

Separation stages were not available in either Sinop or Agudzeri.

was produced in Sinop and sent to

25X1

25X1

(2) Odd-Sized Barriers. Another task which, for reasons similar to those given for the conic barrier, must have originated outside Sinop called for the manufacture of two series of tubular barriers having odd-sized diameters between 30 and 35 mm and between 20 and 25 mm. In each case, a small series was manufactured and sent to an unidentified installation.

construct larger welding machines. A small series of

an unidentified installation. These barriers were not investigated for separation factor, as suitable

barriers,

these conic

(3) Duplex Barrier. Still another barrier development task, which evidently was for an installation other than Sinop, called for the design of a duplex barrier. That is, two tubes were mounted concentrically. The inside tube had a diameter of 13 mm while the outside tube had a diameter of 15 mm. Again, a small series was produced which went to an unidentified installation.

	SECRET - 32 -		25 X 1
••	Separation Tests of Modified Barriers. The above list is not exhaustive. Anywhere from 20 to 50 barriers were made as result of each of these experiments. These barriers		
	were shipped away from Sinop. None of these experiments led to any major		25 X 1
	improvement of the Standard Thiessen Barrier, and none of the variations (paragraph a) had been incorporated into the Soviet production program of the Standard Thiessen Barrier		25 X 1
			25X1
	Samples of the barriers, especially those listed under paragraph a, were sent to Bartell's laboratory, where a separation stage and equipment to measure the mechanical stability of the barriers was available. These improvements gave no changes in the gamma and delta gamma over gamma values as compared with the normal production series (i.e.,		
	Standard Thiessen Barrier) in Sinop. In connection	* 4	25X1
	with Bartell's work, the separation experiments were made with a mixture of carbon tetrachloride and benzol, and that the separation factor was determined by means of "zero density determination." That is, the density for two model gases taken separately was first determined. The		
	gases were then condensed and mixed. Thereupon, the density of the mixture was measured. It was then possible to calculate the difference in density between the diffused and non-diffused gas.		
AUI	OMATION OF PRODUCTION PROCESS FOR STANDARD THIESSEN BARRIER		
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			25 X 1
			20,77
		-	

53.

20.

25X1

The second se	
	.25X
Soviet Rudanovskiy worked on automation in Sinop from August 1950	
Rudanovskiy had been deputy	25
director of the tsekh in which the Thiessen barrier was being	
introduced.	0
	2
When	
Rudanovskiy arrived in Sinop in August 1950, his transfer had involved a demotion resulting from a scandal	
of some kind, Rudanovskiy	25
was accompanied by an unidentified Soviet who was related to him	
by marriage. At this time, a special section was organized in the	
Thiessen department and was headed by the Soviet Prokudin; it was staffed only with Soviets. The major preoccupation of this section	
was corrosion and passivation work. Rudanovskiy took charge of a	
subsection in the Prokudin section, and with a staff of approximately	
six other Soviets, including the aforementioned relative, worked on	
the problem of automatizing the production process for the manufac-	25
ture of the Standard Thiessen Barrier. Rudanovskiy might have coupled this work with attempts to improve	20
the Standard Thiessen Barrier.	
	25
the laboratory was out of bounds to all Germans except Thiessen.	
an assembly line with a large number of rollers and	
rolling tables had been set up. To satisfy the space requirements	
for such an assembly line system, Rudanovskiy had been given a	
room at least 15 meters long in the basement of the Thiessen	
department's building in Sinop.	
^	
	0574
	25 X ′

	25X
The work of Rudanovskiy and his subsection continued until the middle or end of 1951, at which time Rudanovskiy and his relative left Sinop abruptly for an unidentified destination. Rudanovskiy transfer was again accompanied by a scandal.	
COMPETING TYPES OF BARRIERS DEVELOPED AT SINOP	
Complete Control of the Control of t	
The Standard Thiessen Barrier was not the only barrier designed or developed in Sinop between 1945 and 1955. Upon the crystalliz tion of the Soviet specifications, the spraying technique of Thiessen became the nucleus of the development work, and evidentl this technique was accepted by the Soviets as a solution for the barrier project when it was introduced into Elektrostal.	
"simplifying, or rather reducing the number of manipulations; bas	
changes were made with the aim of getting away from inaccurate may work by using machine operation. Neither of these efforts appear to have had at any time a priority (in terms of manpower or material) assigned by the Soviet administration in Sinop, and the	nual r _{/i} .
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changes were made with the aim of getting away from inaccurate may work by using machine operation." Neither of these efforts appear to have had at any time a priority (in terms of manpower or material) assigned by the Soviet administration in Sinop, and the can fairly accurately be described as the independent efforts of Soviet Burdiashvili Ziehl's Barrier Development - Direct Decomposition Method	restance of the state of the st

An official investigation established Rudanovskiy's responsibility.

S-E-C-R-E-T
-35-

25X1

25**X**1

63.

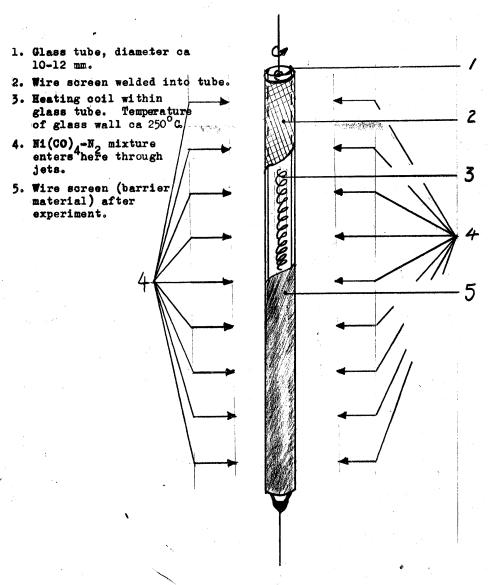
a. Direct Deposition of Nickel Powder on Single Tubes.

A screen was welded into a tube of required dimensions, and this tube was processed into a barrier as follows:

- 1) The sketch on page 36 shows the equipment for the first steps of the process: In a vertically mounted cylinder (not shown) was placed the tube that had been welded from wire screen (Point 2). Within the screen was placed a glass tube (Point 1), and within the glass tube was located a heating coil (Point 3). The entire assembly could be rotated. The glass tube and the wire-screen tube were concentric, with a slight gap between the two walls. Into this gap was fed a mixture of nickel carbonyl and nitrogen (Point 4). The nickel carbonyl then decomposed directly inside and along the meshes of the heated wire screen to form nickel powder (Point 5) and carbon dioxide.
- (2) In order to assure a uniform distribution of nickel powder along the screen, a pair of ventilators was placed in the gap between the glass tube and the screen tube to act as stirrers. The ventilators are not shown on the sketch.
- (3) For the second step of the process, a planetary roller system was designed. Figure 1 on page 37 is a perspective view of the machinery when in operation. Figure 2 on page 37 shows the machinery when opened. The points described below refer to Figure 2 on page 37.
- (4) Point 1 is a pressure roller which locks the tubular barrier (Point 3) in the roller frame (Point 2), which consists of two rollers rotating in opposite directions. Within the barrier tube was placed a solid metal rod, of slightly smaller diameter, called Walzkern, (Point 4). In order to take into account the expansion and the deformation of the barrier tube, a number of these Walzkerne were available, each differing in radius by

Text continued on page 387

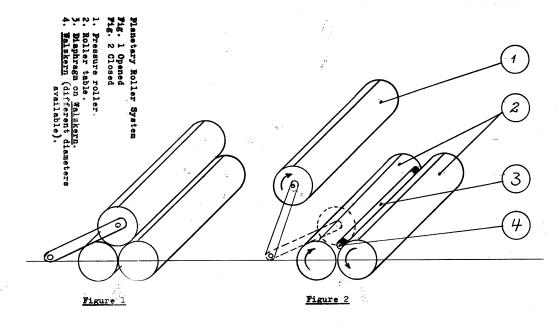
S-E-C-R-E-T 25X1



APPARATUS FOR MANUFACTURE OF TUBULAR BARRIERS BY DIRECT DECOMPOSITION OF Ni(CO)₄-N₂ MIXTURE ON WIRE SCREEN TUBE

S-E-C-R-E-T

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5-E-C-R-E-T

PLANETARY-TYPE ROLLERS USED IN CONNECTION WITH APPARATUS FOR THE MANUFACTURE OF TUBULAR BARRIERS BY DIRECT DECOMPOSITION OF N1(CO) $_4^{\rm C}$ N $_2^{\rm MIXTURE}$ ON WIRE SCREEN TUBE

Sanitized Copy Approved for Release 2010/04/14 : CIA-RDP80T00246A032701020001-5

S_B_C_R_E_T - 37 -

SECRET - 38 -

25X1

O.1 mm. After a few passes, the Walzkern was withdrawn from the barrier tube, and the next appropriately dimensioned Walzkern was inserted into the tube.

25X1

as it was impossible to take account of the various deformations of the barrier tube. Because of the counterrotation of the two base rollers between which the Walzkern rested, the barrier tube always formed bulges which were then rolled flat. Consequently, the barrier always developed creases or was torn.

25X1

(7) This process did not provide for sintering. It was

(6)

- (7) This process did not provide for sintering. It was found that the direct decomposition would link the nickel particles sufficiently without sintering. The screen was heated and, as the first particles decomposed along the wire screen, each particle became heated and thus permitted another nickel particle to decompose on top of it. When these were rolled, the cohesive strength was believed to be sufficient.
- (8) In addition to making sintering unnecessary, this system was thought to have another advantage in that it would yield a more favorable structure than was obtained with Thiessen's spraying method.

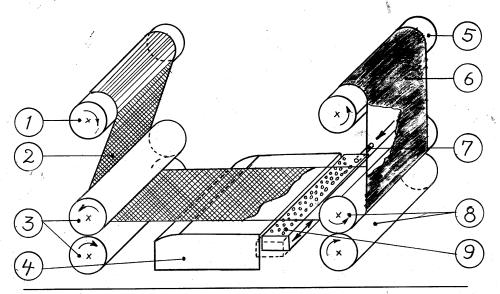
 the nickel particles have a tendency, both in the generator and during the spraying process, to coagulate in a form similar to cotton batting, that is, they form a loose structure of indefinable shape. In the direct decomposition of nickel carbonyl, however, the cotton batting phenomenon hardly ever occurred, and if it did, the interconnected crystals were rolled into the meshes of the screen.
- (9) The above experiments proved the feasibility of the principle of direct decomposition, even though it demonstrated the impracticability of the planetary roller system. This equipment was, therefore, discarded and was soon forgotten. The direct decomposition principle, however, was then transferred to equipment which could fabricate barriers continuously in the form of a running strip.
- making use of a running-strip system,

 was nicknamed locally "Pandora's Box." A perspective drawing of the system appears on page 39.

25**X**1

25X1

- Roller with untreated wire 4. Heating table (temp. below 400° C and soreen Sanitized Copy Approved for Release 2010/04/14: CIA-RDP80T00246A032701020001-5 clutch.
- 2. Wire screen (ca. 25 cm wide)
- 3. Transport roller
- Collector roller for finished barrier materi al
- 6. Barrier material



- 7. Tube through which the Ni(CO)₄-N₂ mixture enters
 8. Pressure and transport roller, synchronized with roller (Point 3)
- Jet device; moves in direction of arrows by a distance equal to distance between jets and with a frequency of less than 50 cycles.

S-E-C-R-E-T

S-E-C-R-E-T **∞ (10)** ∞

25X1

(1) A strip of wire screen of the same specifications as that used for the Standard Thiessen Barrier was "etched" and then was wound anto a run-off spool (Point 1). This run-off spool was equipped with a (Point 1). This run-our sproof are screen (Point 2), slipping clutch. The nickel wire screen (Point 2), which had a width of approximately 20 or 25 cm, was slowly unrolled by the driving rollers (Points 8 and 9). The speeds of all rollers were synchronized. While passing between the rollers (Point 3) and rollers (Points 8 and 9), the wire screen passed over a heated plate (Point 4), which was kept at a temperature which was above 200°C and below 400°C. After passing over the heating plate, the wire screen passed over an arrangement of jets (Point 9), from which fine streams of nickel carbonyl and nitrogen emerged. There were at least 20 jets. The distance between the jets of the same row was roughly 10 mm. The jet device moved in the direction indicated on the sketch and with an amplitude equal to the interval between the jets. There may also have been an added elliptical movement. The frequency of the oscillation was below 50 cycles per second,

25X1

25X1

The purpose of the movement was to obtain uniformity of the sprayed layer.

The jets in the spraying device were externally cooled with water.

- (2) The wire screen (Point 6), on which the nickel powder had been deposited by decomposition of the nickel carbonyl, then passed through the rollers (Point 8 and 9) and was wound on the collector roller (Point 5).
- (3) If a sufficient quantity of nickel powder was not deposited on the first run through the apparatus, it was possible to send the roll of wire screen once again through the entire process.

(4) The wire screen moved at a speed of about one millimeter per second over the jet device, or about three meters per hour.

25X1

(5) The process did not provide for a sintering step. This was not thought to be required, but such a step could easily be added to the process without loss to the automatic character of the machinery.

25X1

S.E.C.R.E.T 25X1 gt. - 41 -(6) 25X1 In some respects, the mechanical properties of this barrier material were superior to those of the Standard Thiessen Barrier. This was especially true of its ductility. The powder clung so hard to the wire screen that it would not fall off when the wire was vigorously bent back and forth, whereas with the Standard Thiessen Barrier such a procedure would leave a bare wire screen. 25X1 (7) this development was very promising, although no tubes had as yet been welded. Suddenly, the entire project was halted, with the explanation that wire-screen material was in short 25X1 supply. In spite of reports on this project, the Soviets never evinced interest in the project. more ambiguous. Thiessen's role was somewhat 25X1

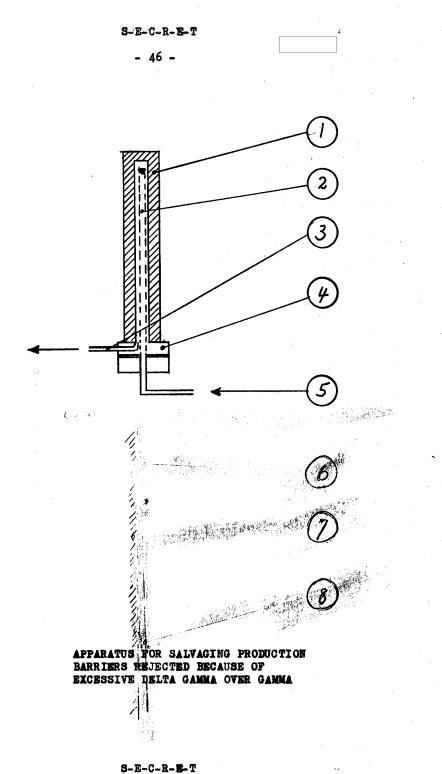
25X1 Burdiashvili's Barrier Development - Sedimentation Method 25X1 64. Burdiashvili, attempted to design barriers using the sedimentation method. 25X1 Burdiashvili came to the sedimentation process simply in an effort to find a method to replace the spraying of nickel powder suspension, which was a disagreeable and unhealthy procedure. 25X1 65. Wire screens which had been etched and rolled were placed at the bottom of a rectangular copper vessel, approximately 60 cm x 60 cm x 12 cm. The wire screen was then covered to a depth of 10 cm with a suspension of methyl alcohol and nickel powder. The nickel powder settled on the wire screen through gravitational pull. The vessel was then slowly drained of the methyl alcohol by means of an outlet provided on the bottom of the vessel. The operation lasted about one hour. After the one-hour sedimentation process, the wire screen bore a more or less uniform layer of nickel powder. The screen was then dried, rolled, sintered, and measured for its permeability characteristics. 25X1 25X1 ethyl alcohol could have been used instead 66. it would have the advantage of of the methyl alcohol, and being less poisonous; but for reasons of economy, Burdiashvili chose methyl alcohol. The nickel powder used in this sedimentation process was obtained by the reduction method. This is not because the technique required the use of reduction powder instead of nickel powder from nickel carbonyl, but rather because nickel powder from nickel carbonyl was generally in short supply. All the powder produced from nickel carbonyl at that time was required for the spraying method. 25X1 26 In 1946 and 1947, 25X1 Burdiashvili worked on the production of nickel powder by a reduction method.

Like the Butterbrot barrier, sedimentation entails first a coarse bowder layer on which a fine-grained powder layer is deposited. But because of the very thin coating and (b) because of the elementary magnetism of the nickel powder. Though this elementary magnetism is very small for nickel powder, it nevertheless causes the larger particles to carry along the small particles, so that the medium sized particles settle on the entire surface area. 2 A few hundred barriers of this type were made. Burdiashvili had as many as 50 of the rectangular copper vessels in operation. It was found that the barriers were superior to the Thiessen sprayed parrier in respect to uniformity. the disad- vantage of the Burdiashvili process was that the barrier was covered with nickel powder on only one side. This led to a lower stability of the barrier tube.		S=E=C=R=E=T		2
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S-E-C-R-E-T In the midst of the development work, 25X1 the screen material was not available, the experiments were halted. Thiessen had shown very little interest in this work, although the top Soviet administrative official in Sinop, Gen. Kochlavashvili, was supposed to have been interested. 25X1 Thiessen might have feared the competition of Burdiashvili and perhaps disparaged the work for not wholly disinterested motives, 25X1 with a collective Stalin Prize, First Class. Thiese Thiessen, as well as two Soviets Trubnikov (fnu) and Olshevskiy (fnu), probably from Elektrostal, were also included in this collective Stalin Prize. 25X1 After this project was discontinued, Burdiashvili worked on spray-25X1 ing processes with reduction powder and Monel powder Towards the end of 1952, Burdiashvili left Sinop with Thiessen, and returned again in January 1955. 25X1 PROCESSES FOR SALVAGING PRODUCTION REJECT BARRIERS 72. 25X1 the problem of salvaging reject barriers, The problem consisted of taking finished production barriers with delta gamma over gamma or gamma values outside the range of the technical requirements and of devising measures which would bring the characteristics of these barriers into the specified range. 73. 25X1

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The problem inv	volved was twofold:		
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	s with gamma values lower than hese gamma values.	the specified limit	
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25X1 S-E-C-R-E-T

a. Point 1 is an electrically heated oven insulated with asbestos, which was kept at a temperature higher than 200°C and lower than 350°C. Into this oven was placed

the barrier (Point 2), which was plugged at one end. Point 3 is an exhaust tube, and Point 4 is a cooled flange.

- 47 -

b. A mixture of nickel carbonyl and nitrogen entered the tube (Point 5). The mixture was at a pressure of 30 to 40 mm, and as it passed through the warmed diaphragm, the nickel carbonyl decomposed in the pores of the barrier. The control of pressure was important because of the rapid (quadruple) splitting off of the CO molecules from the nickel carbonyl.

no pressures in excess of 50 mm were used. Experiments were also made at very low pressures; i.e., 10 mm or 20 mm.

25X1

25X1

76. The nickel carbonyl decomposed as a wedge-shaped layer with the thicker part at the bottom of the tube. It was, therefore, decided to rotate the barrier by 180 degrees in the middle of the operation. Thus, the end of the barrier which pointed upward during the first half of the operation was pointed downward during the last half of the operation. In this way, a fairly uniform layer of nickel powder was deposited on the surface.

25X1

77. As was expected, the larger part of the nickel carbonyl passed through the big pores; the smaller part passed through the smaller pores, thus reducing gamma and improving delta gamma over gamma. experiments showed that any barrier could be brought into the required norm range if the excess delta gamma over gamma was not caused by a single hole or a few large holes. This treatment of the barrier only very slightly decreased the gamma value,

25X1

78. After successful experiments

25X1

constructed another apparatus on the same principle but capable of holding five or six or eight tubes at one time. This larger apparatus operated automatically; that is, the valves in the system were electromagnetically actuated and were controlled by an electric programming system. During this operation, a valve placed at the entrance was closed. When a definite pressure was obtained, a magnetic valve opened the entrance for a specified time to let in a specific volume of nickel-carbonyl and nitrogen mixture. This volume was, of course, dependent on the concentration of the mixture. This cycling continued automatically for about one hour. A selector dial on the apparatus made it possible to select in advance the regimen desired; that is, the time the exhaust valve and the inlet valve were to be opened could be programmed.

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82.		25 X 1
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	Increasing the Permeability of the Barrier	
63.	Increasing barrier permeability was simply a matter of making small pores bigger. The apparatus for this purpose was very simple, and no sketch is supplied. The apparatus made use of the following principle:	25X1
	a. At a temperature of approximately 60°C, nickel carbonyl was formed from nickel and carbon monoxide. A tube with	
	low gamma values was placed in a glass tube which served	
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as a so-called cooling jacket. The cooling jacket, in turn, was connected with a Hoeppler thermostat, which kept the temperature somewhere between 60°C and 80°C. The heating was not performed with radio frequency but was water heating.

b. At a place of negative pressure, carbon monoxide was introduced, which entered through the pores of the barrier tube. The nickel carbonyl, which was formed as result of the interaction, deposited on the bottom of the device. It was found that more of the gas streamed through the larger holes of the barrier tube, with the result that the larger pores became larger at a faster rate than the small pores of the barrier. This led to a rapid increase in the delta gamma over gamma value, far beyond the permitted specification range, while the gamma value increased relatively slowly.

84. The experiments were carried out shortly before Thiessen's departure from Sinop in late 1952.

Thiessen included it in

the inventory of equipment which accompanied him to Moscow.

INTRODUCTION OF STANDARD THIESSEN BARRIER INTO SOVIET PRODUCTION

Experimental Tsekh in Zavod 12, Elektrostal

85. In spring 1948, after the first zero series of 300 to 400 Standard Thiessen Barriers had been manufactured in Sinop, a group of Soviet engineers from Elektrostal arrived in Sinop.

25X1

25X1

While there,

the group was assigned to the Thiessen department and was instructed in all phases of the production of the Standard Thiessen Barrier.

86. In the beginning of June 1948, a group of German specialists from the Thiessen department in Sinop was sent to Zavod 12, Elektrostal.

Until the end of August 1948, they remained in Elektrostal and introduced the process for the manufacture of the Standard Thiessen Barrier.

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Not all the Germans stayed for the eight weeks. It appears that Thiessen, Krecker, and Miss Schilling left before the end of August. Hartz, too, left earlier for Sinop, but returned again

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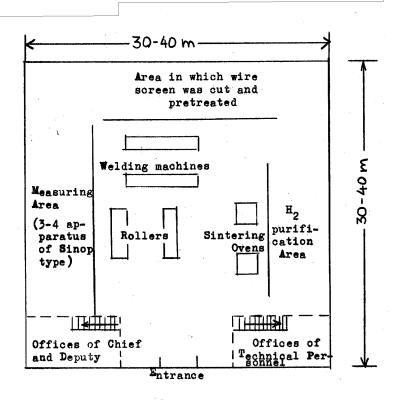
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87. The Germans performed their work in a small building which served as an experimental plant. The official term for the building was tsekh.

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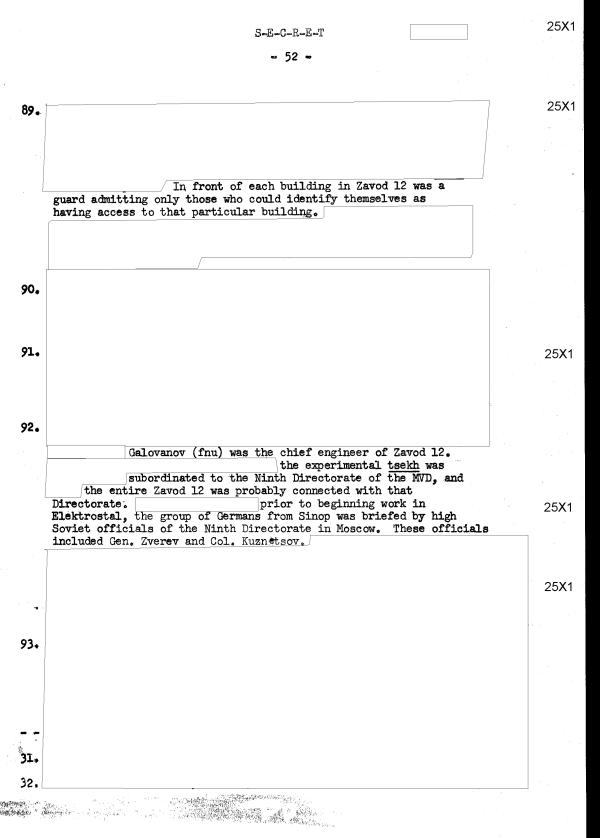
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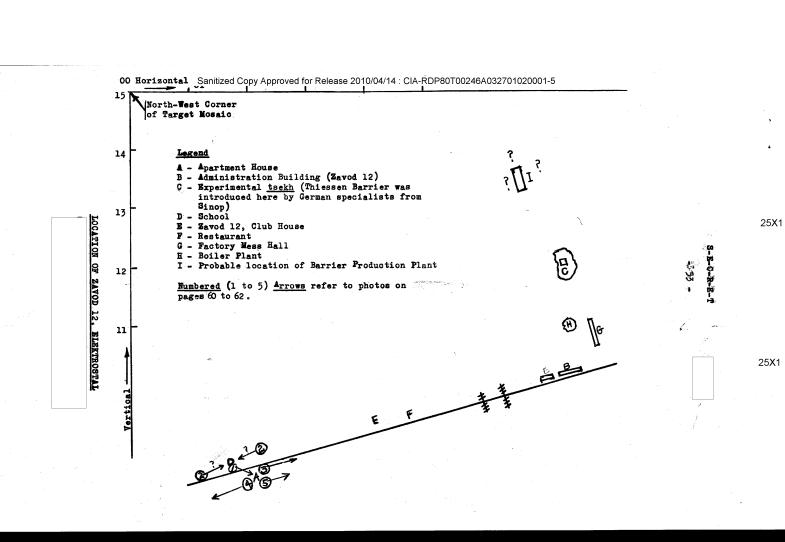
FLOORPLAN OF EXPERIMENTAL TSEKH, ELEKTROSTAL

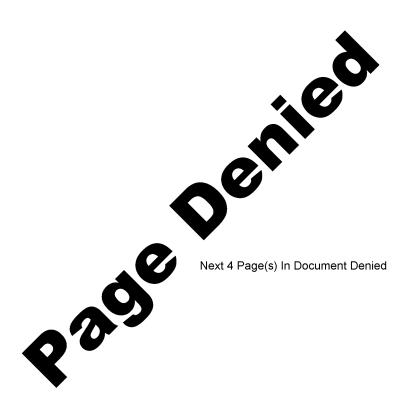
88. In the building was exactly the same type of equipment as that used in Sinop for the production of the Standard Thiessen Barrier except that the numbers of every machine or device was multiplied by a factor of four to six. The machinery, with the exception of the sintering ovens, had been built in Sinop.

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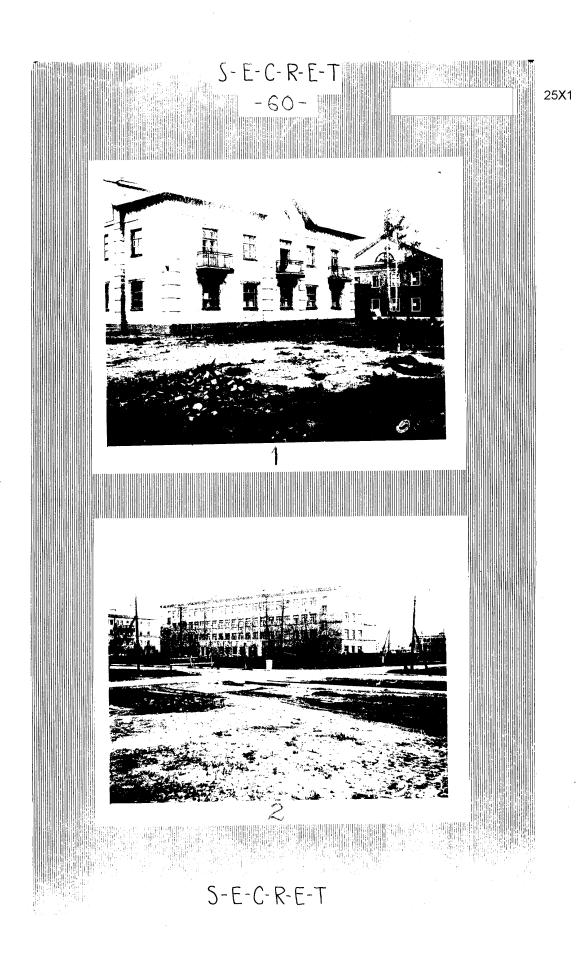
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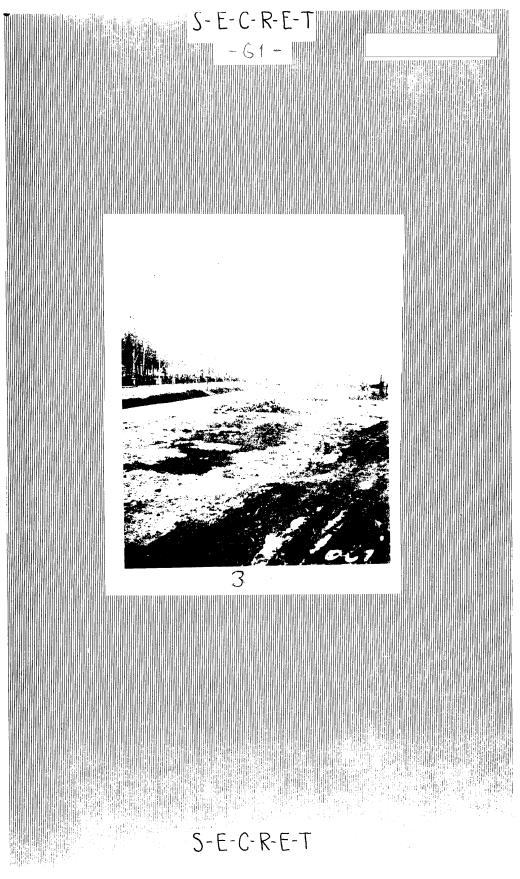


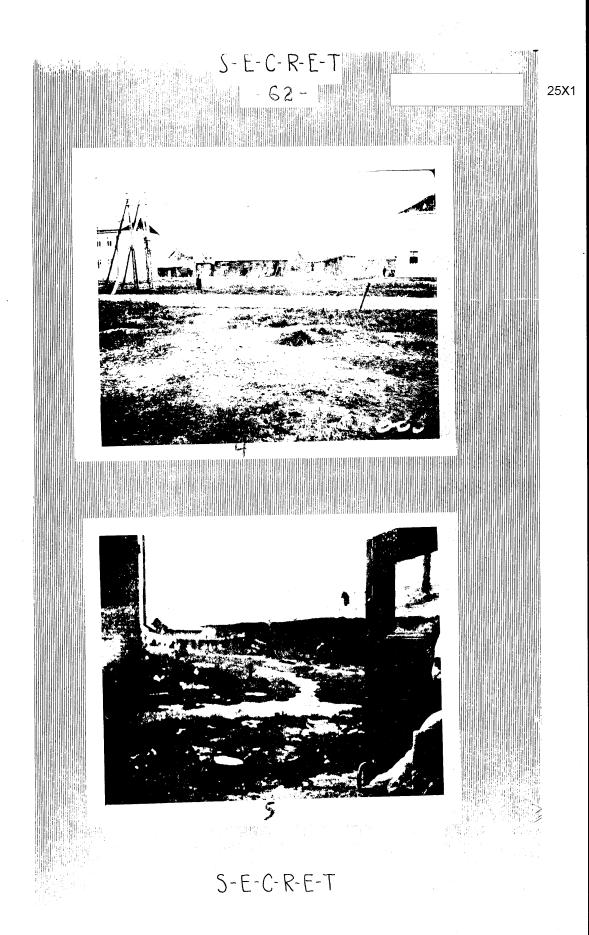
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i r t	immediate vicinito position of the s the overlay of Za	otographs show buildings and sites in by of Zavod 12 in Elektrostal. The a sites depicted may be obtained with r avod 12 appearing on page 55 on which indicated by arrows:	pproximate eference to	
	Photo 1:	Apartment house or guest house of Z in which German sp from Sinop were housed during their assignment in Elektrostal.	ecialists	25X1
	Photo 2:	A school in Elektrostal.		25X1
	Photo 3:	Ulitsa Karla Marksa. This asphalte street led east from the guest hous to Zavod 12.		
	Photo 4:	View west-southwest from guest house	e (1)	
	Photo 5:	View east from guest house (1).		
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COUNTRY	USSR (Abkhaz SSR)	REPORT		
SUBJECT	Development of Barrier for Gaseous Diffusion in Sinop from 1946 to 1952,	DATE DISTR.	20 February 1957	
	Diffusion in Sinop from 1940 to 1972	NO. PAGES	63	
		REQUIREMENT	RD	
DATE OF INFO.		REFERENCES		25X1 25X1
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Sanitized Copy Approved for Release 2010/04/14: CIA-RDP80T00246A032701020001-5 25X1 S-E-C-R-E-T REPORT **COUNTRY** USSR (Abkhazekaya ASSR) DATE DISTR.11 Jan 57 **SUBJECT** Development of Barrier for Gaseous NO. OF PAGES 52 Diffusion in Sinop from 1946 to 1952 PLACE ACQUIRED NO. OF ENCLS. (LISTED BELOW) DATE ACQUIRED SUPPLEMENT TO REPORT NO. 25X1 **DATE OF INFORMATION** THIS IS UNEVALUATED INFORMATION

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TIME TABLE FOR GASEOUS DIFFUSION BARRIER DEVELOPMENT IN SINOP

Various Preliminary Attempts at Barrier Development.

Development of Methods for Producing Nickel Powder.

Development of Standard Thiessen Barrier.

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Statistical Survey to Determine Optimum Industrial Regimen.

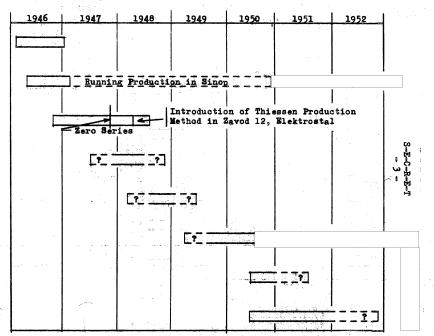
New Methods for Barrier Manufacture. (Burdiashvili/Ziehl).

Passivation and Corrosion

Studies.

Automation of Standard Thiessen Barrier. (Rudanovskiy).

Salvaging of Rejected Production Barriers.



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TRODUCTION TRODUCTION TRODUCTION TRODUCTION TRODUCTION The highest authority of the continues was Gen. Aleksandr Ivanovich Konceeded for a short time in 1952 by Col. in in 1952, this office was abolished. In the in 1952, this office was abolished. In the same of the combined in title was Pleniph insters. He appeared to act as liaison pervising echelon in Moscow, as well as enthe Sinop and Agudzeri institutes were rector of the combined institutes was VI by sics professor from Moscow University of the same in Agudzeri were moved to Sinop, fices were maintained in Agudzeri; a miniputy for administration, Pëtr Varlam ovi chnical offices in Agudzeri and Sinop we chnical matters, Boris Mikhaylovich Isay Sinop and Ilin Filippovich Kvartskhava udgeri. The divisions of responsibility chnical directors was not made on the basion alone. Kvartskhava was responsibudzeri but also for at least one departments also for at least one department descri was not responsible to Kvartskhav fice in Sinop. Evidently the division be the basis of scientific fields, with Kvarts with an emphasis on chemical science partments with a primary emphasis on phy GANIZATION OF THE THIESSEN DEPARTMENT FREE work of setting up Sinop Institute and gan in fall 1945 and continued through swever, had already begun minor research	combined ochlavas. Lordki potentia between re combiliadimiry. Most and onlinistrati ich Chelere unde yev (Fir (Second y betwee asis of ble for tent in tent of twa but to between wartskhae, where	hvili, w panidze ry of the Sinop a Agudzer ned in 1 Vasilyev of the y branch on was u idze. Tr two de st Deputy ne the two geograph some dep V Werner o Isayev the two va super	ho was (fnu); som e Council nd the hig i and Mose joso, the fich Miguli administra administra nder the S he scienti puties for y Director Director) o deputy ical artments i iz., the Schuetzel who had h deputies w vising dep	of chest cov. tirst in, tive cative coviet fic in in in	
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n 10 May	1946, conferences took place in Sinop at which each depart-	
ment, 1.e	n its assignment for the next years.	
es STAGE	1 108 assignment for one near years	25X1
hree les	ding Soviet scientists participated in these conferences. They	
ad been	in Sinop for some time in 1946, and had assisted the three	
erman de	epartment chiefs in setting up the institute.	25 X 1
lamah Dani	the name of the scientist who assisted von Ardenne, viz., yevich (fnu). the scientist who assisted	
	was elderly, was balding, and had one or two prominent swellings	
n his he		
s a posi	tive incentive, the Germans were shown a table on which a pre-	
nium or a	ward was listed for each task. It was during one of these	
	es that the Thiessen department was given the project of	
levelopin	ng barriers for gaseous diffusion.	25X1
		20/(1
he Thies	sen department worked on the barrier project from 1946 to 1952,	
lthough	the problem of producing a workable barrier had been essentially 1948. During these years, the Thiessen department was organized	
	on the chart on page 6.	
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Cey to Ox	rganization Chart	
	A CONTRACTOR OF THE PROPERTY O	
		25 Y 1
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	The function of the	25X1
various s	The function of the sections during the different periods will be tabulated below.	25X1
various s	sections during the different periods will be tabulated below.	25X1
The perso to German	sections during the different periods will be tabulated below. onnel have been listed by numbers: the numbers 1 to 32 apply n nationals; the numbers 50 and higher apply to Soviet nationals;	25X1
The perso to German	sections during the different periods will be tabulated below. onnel have been listed by numbers: the numbers 1 to 32 apply	25X1
The perso to German an asteri	sections during the different periods will be tabulated below. onnel have been listed by numbers: the numbers 1 to 32 apply n nationals; the numbers 50 and higher apply to Soviet nationals; isk beside a number indicates the head of the section.	25X1
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The person to German asteri	sections during the different periods will be tabulated below. onnel have been listed by numbers: the numbers 1 to 32 apply n nationals; the numbers 50 and higher apply to Soviet nationals; isk beside a number indicates the head of the section.	25 X 1
The person to German asteri	rections during the different periods will be tabulated below. Something the different periods will be tabulated below. Something the numbers: the numbers 1 to 32 apply in nationals; the numbers 50 and higher apply to Soviet nationals; isk beside a number indicates the head of the section. I numbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen	25X1
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The person to German asteri	rections during the different periods will be tabulated below. Something the different periods will be tabulated below. Something the numbers: the numbers 1 to 32 apply In nationals; the numbers 50 and higher apply to Soviet nationals; Isk beside a number indicates the head of the section. I numbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt	
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The person decrease as terms a	prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell Ludwig Albert Wilhelm Ziehl Wilhelm Willij Lange Erich Wilhelm Franke	
The person decrease as terms a	rections during the different periods will be tabulated below. Somethias been listed by numbers: the numbers 1 to 32 apply In nationals; the numbers 50 and higher apply to Soviet nationals; The section of the section. I will will be a number indicates the head of the section. Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell Ludwig Albert Wilhelm Ziehl Wilhelm willid Lange Erich Wilhelm Franke Wolfgang Friedrich Srecke	
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The person to German asterian asterial 2 3 4 5 6 7 8 9 10 11	rections during the different periods will be tabulated below. Somethia been listed by numbers: the numbers 1 to 32 apply In nationals; the numbers 50 and higher apply to Soviet nationals; Isk beside a number indicates the head of the section. I mumbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell Ludwig Albert Wilhelm Ziehl Wilhelm Willi Lange Erich Wilhelm Franke Wolfgang Friedrich Srocke Werner Siegling Kurt Heptner Irmgard Schumacher (nee Striepling) ers 69 to 75 and No. 29 appear only on the chart of the organization	25X1
The person to German asterian asterial 2 3 4 5 6 7 8 9 10 11	rections during the different periods will be tabulated below. Somethia been listed by numbers: the numbers 1 to 32 apply in nationals; the numbers 50 and higher apply to Soviet nationals; isk beside a number indicates the head of the section. I mumbers refer to the organizational chart on page 67 Prof. Peter Adolf Thiessen Dr. Gerhardt Siewert Dr. Werner Wittstadt Dr. Hans Bartell Ludwig Albert Wilhelm Ziehl Wilhelm Willij Lange Erich Wilhelm Franke Wolfgang Friedrich Srocke Werner Siegling Kurt Heptner Irmgard Schumacher (nee Striepling)	25X1

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S-E-C-R-E-T

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:	1	2	3 1947/48-	4 1040 to	5
SECTIONS	M1d-1946	End-1946	1941/48-	1949 to Aug. 1950	Aug. 1950- End-1952
(A) Metallurgical Lab I	50#	16 * ,51,21,	51*,21,68,	51*,21,68,	51*,68
(B) Metallurgical Lab II	///	5*,26,15	///	///	63*,67,64
(C) Technological Section	///	///	5*,12,13, 14,19,20, 23,24,25, 52,55,56, 57,60,61, 8,9,15,26	5*,54,55, 25,58,56, 57,10,23, 24,26	54*,55,25, 10,57, 5, 58,59,60
(D) Design Section	6*,11	6,11	22*, ?	22*,26	22*,26
(E) Thiessen's Private Laboratory	1*,13	1*,12,13, 14,	///	1*,13	1*,13
(F) Physical Laboratory	4*,12	4*,18,19 20	4*,16	4*,18	4*,9
(G) X-Ray Laboratory	3*,7,10,	3*,7,10, 64	3*,10,27, 65,66	3*,27,7, 31,32	3*,7,27,
(H) Chemical Laboratory	2*,5,26	2*,52,53, 26,55,31, 32	62*,31,32	62*,61,52	62*,61,52
(I) Workshops	8,9	8,9	? ?	8,9	8

ORGANIZATION CHART OF THIESSEN DEPARTMENT

S-B-C-R-R-T

S-E-C-R-E-1

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Susanne Srocke (née Kittan)
Ingrid Schilling
12
13
14
              Martin Krecker
15
16
              Karl Urban Melcher
              Juergen Artur Ziegler
Horst Paul Schnaase
17
18
             Waldemar von Maydell
              Schulze (fnu) **
Heinrich Matthias Eulen
19
20
21
              Eduard Schmitz
              Walter Hartz
22
23
24
25
26
              Gustav Karl Fliegner
              Kurt Panten
Helmut Hepp 9a/
              Dorothea Thiessen
              Margarete Susu Devrient
27
28
              Dr. Ernst Emil Rexer
29
              Fritz Engelhardt
30
31
              Heinz Rackwitz
              Dr. Heinz Karl Moehr
32
              Dr. Wolfgang Gramberg
              Aksyanov (fnu)
Burdiashvili, Shaley Savovich
Lomadze, Æteri/
50
51
52
53
54
55
56
57
58
59
60
61
62
66
66
66
67
68
              unidentified
              Prokudin, Ivan Petrovich
              Yelkin (fnu)
              Yelkin (fnu)
Gorizontov, Boris Arkadyevich
Toshchev (fnu)
Listopad (fnu - husband)
              Listopada (fnu - wife)
              Suslenikova, Vera Mikhaylovna
              Frolova (fnu)
              Sokolova (fnu)
              Rudanovskiy (fnu)
              Oziashchvili, Edika
              unidentified
              unidentified
              unidentified
              Shamba, Nadezhda Alekseyevna
69
              Assotiani, Yasha Rademovich
70
71
              Skiriya (fnu)
Fursa (fnu)
72
              unidentified
73
               Tsomaya (fnu)
74
               Kirvalidze (fnu)
              Mitrenin, Boris Petrovich
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Functions of Sections

Each section of the Thiessen department is identified by a letter from A to I. The various periods shown on the organizational chart are identified by digits from 1 to 5. For example, the code A - 3 refers to Metallurgical Laboratory I during the period 1947/1948 to 1948/1949:

For convenience, the sections and time periods are listed again:

- A Metallurgical Laboratory I
- B Metallurgical Laboratory II
- C Technological Section
- D Design Section
- E Thiessen's Laboratory
- F Physical Laboratory
- G X-Ray Laboratory
- H Chemical Laboratory
- I Workshops
- 1 mid-1946
- 2 end-1946
- 3 1947/1948 1948/1949
- 4 1949 August 1950
- 5 August 1950-1952

WAR COLLEGE

Preliminary experiments for the manufacture of metal Section A-1:

diaphragms.

Section A-2: Manufacture of highly dispersed reduction powder

and powder mixtures.

Manufacture of diaphragms by means of sedimentation. Section A-3:

Section A-4:)
Section A-5: Continued development of diaphragms.

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Section B-1: Non-existent. Section B-2: Manufacture of nickel carbonyl powder. Section B-3: Non-existent. Section B-4: Non-existent. Section B-5: Continued development and automation of diaphragms. Section C-1: Non-existent. Section C-2: Non-existent. Manufacture, development, and automation of the produc-Section C-3: tion of Standard Thiessen Barrier. Section C-4: Corrosion and passivation studies on barriers. Section C-5: Continuation of experiments as in C-4 and determination of reaction speed of uranium hexafluoride and water. Section D-1: Prepared design and technical drawings for apparatuses to D-5 required by all other sections of the Thiessen department. Section E-1: E-2: Development of diaphragms by means of press and spray methods. Section E-3: Non-existent. Section E-4: Supervising other sections. E-5: Section F-1: Development of measuring apparatus for determining to F-5: gamma and delta gamma over gamma of diaphragms. Development of apparatus for determining properties of metal powders by means of sedimentation.

> Development of a separation stage for the determination of separation factor of diaphragms.

Development of high-frequency sintering apparatus for

e. Measurement of the mechanical stability of diaphragms.

S-E-C-R-E-T

use in manufacture of barriers.

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Section G-1:) to G-5:	a. Experiments for the manufacture of metal diaphragms by means of electrolysis.	
	 Designing accessory calculating device (slide- rule) for use with Pechukas and Gage apparatus. 	
	c. Cathode dispersion and X-ray experiments.	
Section H-1:)	a. Inorganic analyses.	
to H=3: '	b. Manufacture or organic barriers.	
	c. Development of fluorine generators.	
	d. Studies concerning H ₂ O evaporation and other distillation problems.	
Section H-4: H-5:	Analytical investigations.	
Section I-1:) to I-5:)	Performed precision machine work for all sections of the Thiessen department.	
Mitrenin Departm	ment (1952-1955)	
was accompanied	2, Thiessen was transferred from Sinop to Elektrostal. He by the following Soviet members of his department: okolova, and two others	
Thiesse Hermann Fritz F departed from Ag	en was also accompanied by his German son-in-law lorek. At the same time Thiessen left Sinop, Yermin gudzeri, possibly to the same location as Thiessen.	25
had been used for equipment:	ith him from Sinop all equipment and apparatuses which or barrier manufacture. Source listed the following	
		25X

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SECRET 11. 25X1 12. At the time that Thiessen was transferred, Prokudin, a Soviet member of the Thiessen department who from 1950 to 1952 had been carrying out the corresion experiments. 25X1 tions to transfer to an institute in Leningrad. All the corrosion equipment was crated and was sent away; but at the last minute Prokudin was ordered to remain behind in Sinop. 13. Upon the departure of Thiessen, the department was placed under the Soviet Mitrenin. As far as the German specialists were concerned, the date of Thiessen's transfer coincided with the end of classified work. The Soviets had gradually removed the Germans from key projects as early as mid-1950. 25X1 Classified work in the most extensive sense of the word, ended with the departure of Thiessen in fall 1952. The organization of the department of Mitrenin between fall 1952 and the time of the departure of the German specialists from Sinop in March 1955 was as follows: <u>Personnel</u> Functions Section 28*, 30, 29, 51, Development of germanium and Metallurgical I silicon monocrystals Manufacture and determination of 5*, 25, 57, 69 Metallurgical II properties of highly dispersed iron powder particles 74* and two uni-Determination of physical pro-Technology perties of semiconductors develdentified persons oped in the Metallurgical I section Design of apparatus required by Design Office other sections Working in cooperation with Me-4*, 9, 71 Physical Laboratory

S-E-C-R-E-T

tallurgical I, this section made sintering experiments with germanium and silicon powders

	- 12 -		
-	A CONTRACTOR OF THE CONTRACTOR		
y Laboratory	X-ray studies, electron microscopy and surface treatment of copper	, 3*, 61, 72, 27, 7, 73, 64, 65	
	(electrolytic)	94.0 At 10 A	
nical Laboratory	Analytical studies connected with distillation problems	2*, 54, 55, 62	
shop	Prepared precision machine work for the entire department	8	
Notes on Soviet	: Parsonnal	# 15 miles	
Notes on Dovie	Terbonici		
	.9	Soviet personnel	25 X
connected with	the Thiessen department		
Aksyanov (fnu)	possibly should be Aksyantsov	i we we	
Assigned to Met	allurgical Laboratory of Thiessen Despois of sintering material.	partment; responsible	
			25 X
Annahland VL	no Podomovich		
Assotiani, Yash	R VEGEHOATCH		
Georgian.			
Burdiashvili, S	Shaley Savovich		
1.00		·	
Senior Scientif	ic Associate.		
			0574
			25X1
S		<u> </u>	25X1
Frolova (fnu),	Mrs.		25X1
Frolova (fnu),	fluorine analysis project in the ch	nemical laboratory of	25X1
Frolova (fnu),	fluorine analysis project in the ch	nemical laboratory of	25X1
Frolova (fnu), Assigned to the the Thiessen de	fluorine analysis project in the ch	nemical laboratory of	25X1
Frolova (fnu), Assigned to the the Thiessen de	e fluorine analysis project in the chepartment.	nemical laboratory of	25 X 1
Frolova (fnu), Assigned to the the Thiessen de	e fluorine analysis project in the chepartment.	nemical laboratory of	
Frolova (fnu), Assigned to the the Thiessen de	e fluorine analysis project in the chepartment.	nemical laboratory of	
Frolova (fnu), Assigned to the the Thiessen de	e fluorine analysis project in the chepartment.	nemical laboratory of	
Frolova (fnu), Assigned to the the Thiessen de	e fluorine analysis project in the chepartment. pris Arkadyevich7	nemical laboratory of	25X1
Frolova (fnu), Assigned to the the Thiessen de	e fluorine analysis project in the chepartment. pris Arkadyevich7	nemical laboratory of	

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and the second of the second o	
Listopad (fnu), Mr. and Mrs.	,
bis object (litty) in a date his	
	25 X 1
Mr. Listopad was assigned to Prokudin's /q.v. / laboratory, while	.
Mrs. Listopada worked on the project for the improvement	
of tubular barriers by direct decomposition of nickel carbonyl.	25X1
Lomadze, Æteri7	
Junior Scientific Associate. Assigned to chemical laboratory of the	
Thiessen department	25X1
	-
Mitrenin, Boris Petrovich	
In 1952, he took Thiessen's post in Sinop.	1
THE TANKS THE COOK TITLED OF THE PERIODS	25 X 1
Ozieshvili, Edika	10 to
	25X1
Worked on electron microscopy and X-Ray in the Thiessen department.	
Prokudin, Ivan Petrovich	
	0574
	25 X 1
Rudanovskiy (fnu)	
Deputy department chief in Zavod 12, Elektrostal.	
pehroh dehar onest guter in vanog iv eterorog eare	25X1
	20/(1

Some of George of T	25,71
Shamba, Nadezhda Alekseyevna]
At first was assistant to Burdiashvili, and later to Dr. Rexer.	25X1
At lirst was assistant to burdlashvill, and later to br. nexer.	
Skiriya (fnu)	
Wife of Assotiani /q.v./. Worked on analytical chemistry problems in the Thiessen department's chemistry laboratory.	
Sokolova (fnu), Mrs.	- 1886
Headed the chemical laboratory of the Thiessen department.	2574
	25X1
Suslenikova, Vera Mikhaylovna	
In Sinop until 1951.	
	25X1
Toshchev (fnu)	
Served as a laboratory assistant,	25 X 1
	20/(1
Tsomaya (fnu)	
Assisted Wittstadt and Franke on electron microscope problems.	a .
	25X1
	•. •
Yelkin (fnu)	
Either Scientific Associate or Senior Scientific Associate.	7
	25X1

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PRELIMINARY RESEARCH ON DIFFUSION BARRIERS IN SINOP

15.

- - a. Siewert: manufacture of organic diaphragms.
 - b. Wittstadt: manufacture of metal foils by an electrolytic process
 - c. Thiessen: pressed metal powder diaphragms.
 - d. Aksyanov (Soviet): manufacture of metal (probably copper) diaphragms.
 - e. Bartell: development of measuring apparatus to measure the porous materials produced by the separate sections; he first used the pressure-equalization method.
- 17. It was not until the end of 1946 that the technical requirements in the form of gamma and delta gamma over gamma specifications were made available. These were: gamma (permeability) equal to 0.8 to 1.2 x 10⁻³ and delta gamma over gamma (change in permeability) less than three percent. The delta gamma over gamma value was specified over a range from 15 to 65 mm of mercury. These requirements did not yet state that the diaphragms had to be metal, but simply specified "stability in respect to uranium hexafluoride."

of gamma and delta gamma over gamma did not have any effect on the preliminary program which had been started in May 1946.

18. A few weeks later (end 1946 to beginning 1947), however, Lt. Gen.
Avraamiy Pavlovich Zavenyagin visited the Thiessen Department in
Sinop and ordered that metal diaphragms be given preference over
organic diaphragms. That is, they were to continue to make the porous dia-

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	phragms in the manner Thiessen had made them ever since May 1946. This was not because Thiessen's work was the most advanced in comparison with the other development projects listed above. On the contrary, Siewert's organic work had progressed ahead of the sections using metallurgical approaches. In any event, the work on the organic diaphragms would have been seriously handicapped at this time, as Siewert and Thiessen had a	25X1
	personal falling out. 10	
19.	Thiessen in his own laboratory, with his assistants, Miss Kittan (later Mrs. Srocke), Miss Schilling, and Martin Krecker, continued to work on sintered metal-powder diaphragms by means of a pressing method. He used for this purpose a modified German press, not in excess of twenty tons, which had been used during the war to manufacture cartridge cases.	
20.	The other groups were reorganized. Soon not only Siewert's project but	
	also Aksyanov's project was dropped. Burdiashvili and Ziegler began to manufacture nickel powder by the reduction method.	25 X 1
,	Bartell and Wittstadt continued with their old projects, the design and construction of measuring equipment and the development of barrier material by the electrolytic process, respectively. This was the division of the Thiessen department which lasted into 1948.	
21.		
		25X
22.	Thiesen obtained satisfactory diaphragms by means of the pressing	
~~	process in spring 1947.	
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		1.	·
	STANDARD THIESSEN PRODUCTION BARRIER		
	General Description		
	At about the time (spring 1947) that the first pressed diaphragms were		
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25X1

S-E-C-R-E-T - 18 -27. Working on a 24 hour a day schedule, the production section of the Thiessen department turned out the 300 to 400 barriers, which constituted a zero or test series. 25X1 The barriers were individually wrapped in tissue paper and then placed in wooden boxes, each containing 100 barriers; wooden partitions formed sections holding 10 barriers each. Although throughout all of 1948, experiments were continued in the Thiessen department to improve the sprayed barrier /see pages 28-32 / it was the barrier of this test series that was introduced into Zavod 12, Elektrostal, in June 1948. For this reason, it will be referred to in this report as the Standard Thiessen Barrier. 28. While the work to improve the barrier was in progress, occasional orders for additional series of the Standard Thiessen Barrier were received in Sinop. 25X1 between 1948 and 1949, at least three or four series of 1,000 barriers each were produced in Sinop. On each occasion, personnel who had meanwhile been assigned to help in other sections of the Thiessen department or had been working on small experimental series in connection with the improvements were conscripted and for a short while worked under great pressure on a 24 hour per day schedule. Again it should be noted that these were series of the Standard Thiessen Barrier as it existed in the beginning of 1948 and as it was introduced in June 1948 in Zavod 12, Elektrostal; these series were not affected by the experiments, then in progress, aimed at improving this barrier. 29. these production series were required to overcome critical needs of a cascade because of some mishap. 25X1 the barrier in a cascade could easily be made unserviceable by opening a wrong valve, permitting the pressure across the barrier to become too high and causing a collapse of the tube. 25X1 Flow Chart and Description of Production Steps ∞30. A flow chart identifying the thirteen separate steps in the production of the Standard Thiessen Barrier, as they were introduced in Zavod 12, Elektrostal, during the summer of 1948 is given below: (1) Determination of nickel Cutting of wire screen powder properties (2) Preparation of the suspension (4)Electrolytic etching Spraying (6) Rolling Step No. 1 Sintering

S.E.C.R.E.T - 19 -

25X1

- (8) Rolling Step No. 2
- (9) Cutting of the wire screen
- (10)Intermediate measurement
- (11) Welding of screen into tube
- Weighing of finished barrier tube
- (13) Determination of permeability of barrier (gamma and delta gamma over gamma values)

31. Concerning these various production steps

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Preparation of Wire Screen

The wire screen used for the sprayed barrier in Sinop was supplied by an unidentified factory in East Germany.

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Everything pertaining to the wire-screen material was considered a matter of security, and was therefore handled by the pervyy otdel or security department

in Sinop.

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In connection with occasional shortages of wire-screen material in Sinop, Col. Mikhail Mikhaylovich Kuznetsov of the Ninth Directorate had once traveled to East Germany in order to expedite shipment;

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During the experiments leading to the final Standard Thiessen Barrier, diverse wire screens with anywhere from 5,000 to 20,000 mesh per square centimeter were used. It was found that the 5,000 mesh was too coarse and resulted in the sinter mass falling out, while the 20,000 mesh was considered too expensive. It was finally decided to use 10,000 mesh wire screen. The diameter of this wire was recalled to be about .05 mm with an unknown tolerance. After early experiments at cutting the wire in the direction of the mesh, it was later decided to cut the screen diagonally as this produced greater stability. The screen was cut into rectangular sections, 15 cm x 55 cm, which was sufficient for two finished tubular barriers when the sprayed screen was cut again (step 9) and welded (step 11).

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S-E-C-R-E-T **= 20 =** The rectangular section, 15 cm x 55 cm, was submerged in a bath of hydrochloric acid and was electrolytically etched so as to roughen the surface of the screen and to reduce its thickness. In arriving at a final specification for the etching phase, two diametrically opposed conditions had to be resolved: on the one hand, it was desirable to etch the wire to make it as thin as possible and, on the other hand, it was necessary to retain the stability of the wire screen. These experiments had been carried out in Wittstadt's laboratory, where two large rectifiers of 50 amperes each were available. Spraying Operation A suspension of nickel powder in ethyl alcohol was sprayed upon the etched and dried rectangular screen. The nickel powder used in the suspension was classified in terms of its shaking weight and shaking volume, and later a particle size which characterized the nickel powder was determined by the Pechukas and Gage test method. 25X1

Rolling, Sintering, and Welding Operations

After the suspension had been deposited on the etched wire screen, a few rolling passes were executed. The rollers used for this purpose were manufactured at Sinop but received their final machining in an unidentified plant in Tbilisi, as Sinop did not have any cylinder grinding machines. The number of passes for each rolling process was specified after experiments which determined how much rolling the mesh could safely stand and how much the volume available for sintered powder was decreased.

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After the first rolling step, the screen was sintered, in a sintering oven, in a reducing atmosphere of hydrogen. the barrier was sintered for about one-half hour at a temperature of about 350°C.	25X1
Before the screen was welded, it was subjected to an intermediate measuring test. For this purpose a Gamma Zange or gamma forceps was designed, with which it was possible to make quick spot checks of the screen and determine whether the barrier had been damaged in production, i.e., large holes formed, etc.	
The rectangular screen was then cut into two equal parts which were welded into tubes. The cutting was performed with a sample cutter similar to a photo laboratory paper-cutter. As stated above, the initial requirements were simply in terms of external dimensions for a flat-plate barrier. Sometime in 1917, the Thiessen department was	2574
ordered, to produce tubular instead of flat-plate barriers. 27	25 X 1
After attempts to solder the nickel wire screen were unsuccessful, it was decided to weld the screen. For this purpose, an electric welding apparatus was designed with which the flat plates, produced in the manner described above, could be welded into tubes. the decision to weld the flat plates was an internal one at Sinop, and that the Soviet order had simply called for tubes. The finished tube had a length of 500 mm and a diameter of 15 mm.	25X1
	25X1
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d.	End Pieces of Barrier	
	it appears	25X1
	that the Standard Thiessen Barrier production process which was	20/(1
	introduced into Elektrostal had no provision for mounting	
	the barrier.	
ĺ		25 X 1
		•
Į		
e.	Measuring Operation	
	When the Thiessen department first began to work on the	
	development of porous material, Bartell and von Maydell began to design an apparatus with which to test permeability	•
	of this material. At first, an apparatus was constructed	
	which made use of a pressure-equalization method. This	
	apparatus, however, did not supply accurate data. In	
	particular, the determination of the time element was inaccurate. In the beginning of 1947, at a time when Thiessen	
	was still making diaphragms by the pressing process, the	
	Soviets supplied a Flacchenmess-apparat (flat-plate measuring	
	apparatus) to Sinop and probably also to Agudzeri.	25 X 1
		20/(1
	The principal reason for supplying the measuring apparatus was to make sure that the same measurement criteria.	
	were used in Sinop as were used in other Soviet institutes. 16/	
		25 X 1
		23/1
	The Soviet-made flat-plate measuring apparatus was accompanied	
	by approximately ten etalon diaphragms. These were standard	
	or calibration diaphragms. The etalon diaphragms were made of nickel without wire-screen support, and had exterior	
	dimensions of 10 cm x 15 cm which was approximately the size	
	of the measuring apparatus. An etalon diaphragm had a	
	greater thickness than the pressed diaphragms then made by	
	Thiessen and was extremely brittle.	25X1
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		25X1
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	S-E-C-R-E-T		25X
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	The Soviet measuring apparatus was used to measure the rectangular screens after the second rolling operation (step 8). Later, when the order for tubular barriers was issued, the Bartell section built another test apparatus making use of the same principles as the Soviet machine.		
a]	ncerning the permeability requirements of the barriers, it ready stated /see page 15/ that the specifications were issuly towards the end of 1946.	was ued	
•			2
1.5		History Sa Strangers S	
of re se of so	e barriers produced in Sinopat the end of 1947 or the beging 1943 satisfied the Soviet technical requirements. The rejecte was negligible. The reason for this was that in the propries in Sinop each barrier could be treated individually, we course, not the case when the barrier was produced on an interest also became the production process was transferred from the seafch institute to the Soviet barrier plant in Zavod 12, E. se problem of rejects became significant (see pages 44-50).	ection the duction this house, and the Sinop	
we	practically all the rejects in the Soviet productre the result of excessively high delta gamma over gamma values.		2

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25X1 S-E-C-R-E-T - 24 -35. 25X1 STATISTICAL SURVEY TO DETERMINE OPTIMUM PRODUCTION REGIMEN 25X1 36. Sometime in 1948, statistical survey of the Thiessen barrier production regimen. 25X1 aim of the study was to determine the optimum regimen for obtaining barriers with specified gamma and delta gamma over gamma values for use in mass production. It was a rather crude analysis of data and not a real statistical analysis in the orthodox mathematical sense of the term. 37. For every barrier that was produced in Sinop during this time, including the production series as well as those barriers produced in connection with studies for improvement of the barrier, a record was made. This information was 25X1 The data prepared on cards included: a. A number identifying the barrier b. Powder used: (1) Nickel carbonyl, reduction, or Monel powder. (2) Particle size of powder as determined by the Pechukas and Gage method. Quantity of powder per square centimeter sprayed on screen. Number of mesh per square centimeter of screen Etching treatment Number of passes during first rolling step Temperature and time of sintering Number of passes during second rolling step

S=E-C-R-E-T

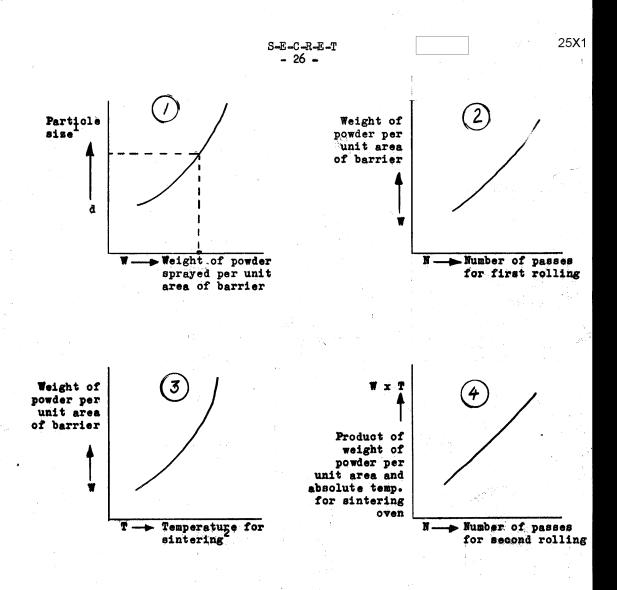
Gamma and delta gamma over gamma values

Thickness of finished barrier Weight of finished barrier

25X1

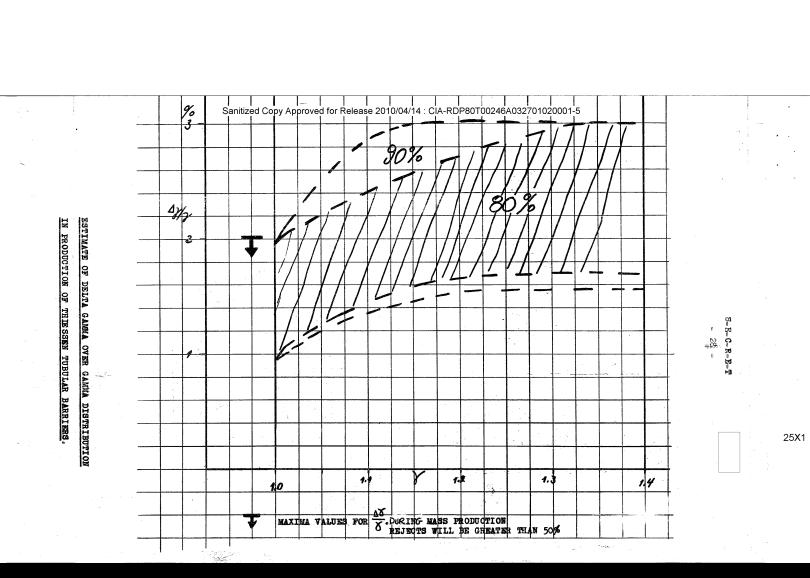
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38.	The information on the cards was plotted graphically in a great number of ways. These graphs may be divided logically into two	
	series. The first series of graphs showed how the thickness, final weight, and gamma and delta gamma-gamma values varied for changes in parts of the production regimen. The second series,	
	which was produced after study of the first, showed the optimum regimen to be used for the production of barriers which would meet the technical specifications for a given powder quality.	25X
	this second series of curves was developed for the use of relatively unskilled technicians; it was to be used in the factory to determine the parameters for the production of the Standard Thiessen Barrier.	23^
39.		25 X
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۰0,	by the Pechukas and Gage method is plotted against the optimum	
	weight of powder per unit area which should be sprayed on the screen as the first step in the process to produce the Thiessen nickel-wire mesh barrier which would meet the specifications.	257
	a second curve could be plotted on the same graph for use with nickel powder manufactured by the reduction method.	25X
1.	The number of passes to be specified for the first rolling process was determined from Graph 2 on page 26. The values on the ordinate of this graph are identical with those on the abscissa of Graph 1.	
2.	The temperature at which the sintering oven should be set for the specified sintering time (one-half hour) was then determined from Graph 3.	
3.	The number of passes required in the second rolling is given in Graph 4 on page 26.	
4.	Similar graphs determined the current to be used in the etching process and the nozzle diameter and powder-to-alcohol ratio in the spraying process.	
5.	Over 90 percent of the barriers manufactured according to these directions lay within the specified values for gamma and delta gamma over gamma. For a specified range of gamma from 1.0 to 1.4 x 10 ⁻³ , the target value would be 1.2 x 10 ⁻³ . In this case, over	
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- Particle size as measured by the Pechukas and Gage method.
- The time of sintering was fixed at about one-half hour.

	S.E.C.R.E.T 27	25X1
	75 percent of the tubes would have gamma values between 1.1 and 1.3 x 10^{-3} , approximately 12 percent between 1.3 and 1.4 x 10^{-3} .	
46.		25 X 1
	ovident that lower delta gamma over gamma values are associated with lower gamma values	25X ⁻ 25X1
	a lower delta gamma over gamma specification for tubes with an average gamma of 1.2×10^{-3} would be out of the question. None of the Standard Thiessen Barriers with gamma values of 1.0×10^{-3} or larger had a delta gamma over gamma of less than one percent.	
	EXPERIMENTS TO IMPROVE BARRIER QUALITY	
47.	The Standard Thiessen Barrier had been successfully completed and the zero series approved by the beginning of 1948. During summer 1948, the manufacturing process for the Standard Thiessen Barrier was introduced into Zavod 12, Elektrostal, by a German group	
		25X1
48.	Also during 1948 and 1949, the Thiessen department received orders for three or four series of the Standard Thiessen Barrier of 1,000 barriers each see page 18/	
49.	In addition to these production efforts, the Thiessen department, in 1948 and 1949, was engaged in work aimed at modifying or improving the Standard Thiessen Barrier.	
		25 X 1
50.	work that had been performed up to this time in Sinop, and the initiative was distinctly local. Within the framework of the Standard Thiessen Barrier project, it was hoped to simplify the	
	technological production steps and also to improve the inherent characteristics of the barrier, such as the mechanical stability or the separation factor.	
51.	Some of the development tasks of this period were of a different nature. That is, the initiative came from outside Sinop.	
		25X1



S.E.C.R.E.T 25X1 - 29 -52. The barrier development tasks of this period are, therefore, listed under two categories: Experiments to Improve Standard Thiessen Barrier. The experiments or manipulations which aimed to improve the Standard Thiessen Barrier or its production process included the following: Variations of Rolling and Spraying Steps. Experiments were conducted in which the spraying and rolling processes were varied in order to determine the effect on barrier quality. These experiments included: spraying one side of the barrier only, leaving the other side of the screen bare; spraying a thin layer of powder on both sides of the screen; covering the screen with powder and then immediately sintering the mesh instead of first subjecting to colling. (2) Butterbrot. Experiments were conducted in which a layer of coarse powder was sprayed on a wire screen, and over this a second layer of fine powder was sprayed. This development task was carried out by Krecker and Miss Schilling in the personal laboratory of Thiessen and went under the nickname (not an official code word of Butterbrot. In some experiments. the first layer was sintered and rolled before the second layer was applied/ 25X1 The coarse powder was selected by the Pechukas and Gage method. In addition to using nickel carbonyl powder, obtained by altering the production regimen, reduction powder obtained locally and powder delivered from outside Sinop were used for the coarse powder layer. Measurements of the gamma and delta gamma over gamma value of the coarse layer were made with the Gamma Zange (gamma forceps). 25X1 For the fine layer, the standard nickel carbonyl powder used in Sinop for the 25X1

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25X1 S-E-C-R-E-T - 31 -(4) Monel Powder. Ziegler developed a method to produce Monel powder by reduction. After Ziegler left Sinop in 1948, the experiments were continued by the Soviet 25X1 Monel was considered Burdiashvili. as an alternate to nickel because this copper-nickel alloy is cheaper than nickel. 25X1 Variations of the Standard Thiessen Barrier Conic Barriers. The Thiessen department developed, presumably on the request of an unidentified installation outside Sinop, a sprayed barrier of conical shape. As the Thiessen department used the Standard Thiessen Barrier spraying process in this development, the task was simply and quickly accomplished. It was required only to design and construct larger welding machines. A small series of these conic barriers/

, was produced in Sinop and sent to

25X1

25X1

(2) Odd-Sized Barriers. Another task which, for reasons similar to those given for the conic barrier, must have originated outside Sinop called for the manufacture of two series of tubular barriers having odd-sized diameters between 30 and 35 mm and between 20 and 25 mm. In each case, a small series was manufactured and sent to an unidentified installation.

Agudzeri./

an unidentified installation. These barriers were not investigated for separation factor, as suitable

separation stages were not available in either Sinop or

(3) Duplex Barrier. Still another barrier development task, which evidently was for an installation other than Sinop, called for the design of a duplex barrier. That is, two tubes were mounted concentrically. The inside tube had a diameter of 13 mm while the outside tube had a diameter of 15 mm. Again, a small series was produced which went to an unidentified installation.

	SEC.=R.=E.=T = 32 =		25 X 1
c.	Separation Tests of Modified Barriers. The above list is not exhaustive. Anywhere from 20 to 50 barriers were made as result of each of these experiments. These barriers were shipped away from Sinop,		25X
L	None of these experiments led to any major improvement of the Standard Thiessen Barrier, and none of the variations (paragraph a) had been incorporated into the Soviet production program of the		25X1
	Standard Thiessen Barrier		25 X 1
	Samples of the barriers, especially those listed under paragraph a, were sent to Bartell's laboratory, where a separation stage and equipment to measure the mechanical stability of the barriers was available. These improvements gave no changes in the gamma and delta gamma over gamma		
	values as compared with the normal production series (i.e., Standard Thiessen Barrier) in Sinop.		2=144
	In connection	J	25X1
	with Bartell's work, the separation experiments were made with a mixture of carbon tetrachloride and benzol, and that the separation factor was determined by means of "zero density determination." That is, the density for two model gases taken separately was first determined. The gases were then condensed and mixed. Thereupon, the density		
	of the mixture was measured. It was then possible to calculate the difference in density between the diffused and non-diffused gas.		
AUT	OMATION OF PRODUCTION PROCESS FOR STANDARD THIESSEN BARRIER		
			•
			25 X 1

53.

20.

Soviet Rudanovskiy worked on automation in Sinop from August 1950 to fall 1951. Rudanovskiy had been deputy director of the tsekh in which the Thiessen barrier was being introduced. When Rudanovskiy arrived in Sinop in August 1950, his transfer had involved a demotion resulting from a scandal of some kind. Rudanovskiy		S~E~C~R~E~T	25X1
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On Rudanovskiy's order, a Soviet laboratory assistant had attempted to desicrate in a vacuum drying oven a fairly large quantity of an unidentified explosive material. Soon after the material was placed in the oven and the bolts were secured, an explosion occurred which destroyed the vacuum oven and fatally injured a Soviet workman. An official investigation established Rudanovskiy's responsibility.

-35-

25X1

25X1

63.

were as follows:

a. Direct Deposition of Nickel Powder on Single Tubes.

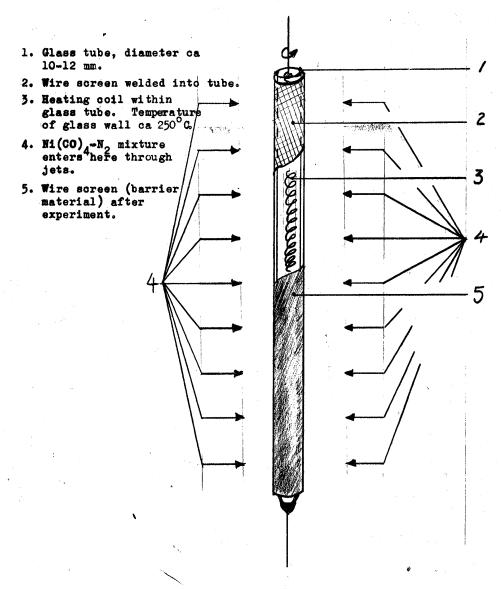
25X1

A screen was welded into a tube of required dimensions, and this tube was processed into a barrier as follows:

- (1) The sketch on page 36 shows the equipment for the first steps of the process: In a vertically mounted cylinder (not shown) was placed the tube that had been welded from wire screen (Point 2). Within the screen was placed a glass tube (Point 1), and within the glass tube was located a heating coil (Point 3). The entire assembly could be rotated. The glass tube and the wire-screen tube were concentric, with a slight gap between the two walls. Into this gap was fed a mixture of nickel carbonyl and nitrogen (Point 4). The nickel carbonyl then decomposed directly inside and along the meshes of the heated wire screen to form nickel powder (Point 5) and carbon dioxide.
- (2) In order to assure a uniform distribution of nickel powder along the screen, a pair of ventilators was placed in the gap between the glass tube and the screen tube to act as stirrers. The ventilators are not shown on the sketch.
- (3) For the second step of the process, a planetary roller system was designed. Figure 1 on page 37 is a perspective view of the machinery when in operation. Figure 2 on page 37 shows the machinery when opened. The points described below refer to Figure 2 on page 37.
- (4) Point 1 is a pressure roller which locks the tubular barrier (Point 3) in the roller frame (Point 2), which consists of two rollers rotating in opposite directions. Within the barrier tube was placed a solid metal rod, of slightly smaller diameter, called Walzkern, (Point 4). In order to take into account the expansion and the deformation of the barrier tube, a number of these Walzkerne were available, each differing in radius by

Text continued on page 387

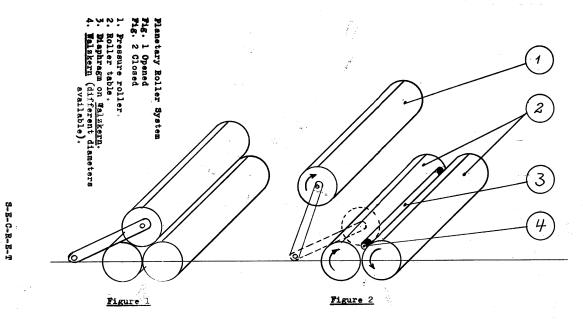
25X1



APPARATUS FOR MANUFACTURE OF TUBULAR BARRIERS BY DIRECT DECOMPOSITION OF N1(CO)₄-N₂ MIXTURE ON WIRE SCREEN TUBE

S-E-C-R-E-T

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PLANETARY-TYPE ROLLERS USED IN COMECTION WITH APPARATUS FOR THE MANUFACTURE OF TUBULAR BARRIERS BY DIRECT DECOMPOSTION OF Ni(CO)₄-N₂ MIXTURE ON WIRE SCREEN TUBE

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S-E-C-R-E-T

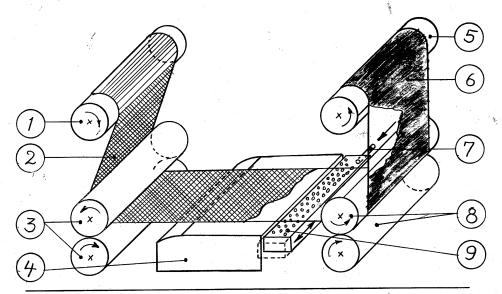
25X1

25X1 SECRET - 38 -0.1 mm. After a few passes, the Walzkern was withdrawn from the barrier tube, and the next appropriately dimensioned Walzkern was inserted into the tube. 25X1 (5) this system could not work, as it was impossible to take account of the various deformations of the barrier tube. Because of the counterrotation of the two base rollers between which the Walzkern rested, the barrier tube always formed bulges which were then rolled flat. Consequently, the barrier always developed creases or was torn. 25X1 (6) This process did not provide for sintering. It was found that the direct decomposition would link the nickel particles sufficiently without sintering. The screen was heated and, as the first particles decomposed along the wire screen, each particle became heated and thus permitted another nickel particle to decompose on top of it. When these were rolled, the cohesive strength was believed to be sufficient. (8) In addition to making sintering unnecessary, this system was thought to have another advantage in that it would yield a more favorable structure than was obtained with 25X1 Thiessen's spraying method. it, the nickel particles have a tendency, both in the generator and during the spraying process, to coagulate in a form similar to cotton batting, that is, they form a loose structure of indefinable shape. In the direct decomposition of nickel carbonyl, however, the cotton batting phenomenon hardly ever occurred, and if it did, the interconnected crystals were rolled into the meshes of the screen. (9) The above experiments proved the feasibility of the principle of direct decomposition, even though it demonstrated the impracticability of the planetary roller system. This equipment was, therefore, discarded and was soon forgotten. The direct decomposition principle, however, was then transferred to equipment which could fabricate barriers continuously in the form of a running strip. Running-Strip Process for Direct Deposition. making use of a running-strip system, 25X1 was nicknamed locally "Pandora's Box." A perspective drawing of the system appears on page 39.

- Roller with untreated wire 4. Heating table (temp. below 400° C and Sanitized Copy Approved for Release 2010/04/14: CIA-RDP80T00246A032701020001-5
- Wire screen (ca. 25 cm wide)
- Transport roller

clutch.

- Collector roller for finished barrier materi al
- 6. Barrier material



- 7. Tube through which the Ni(CO)₄-N₂ mixture enters
 8. Pressure and transport roller, synchronized with roller (Point 3)
- Jet device, moves in direction of arrows by a distance equal to distance between jets and with a frequency of less than 50 cycles.

8-E-C-R-E-T

25X1

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/a \	A strip of wire screen of the same specifications as	
(1)	that used for the Standard Thiessen Barrier was	
•	"etched" and then was wound anto a run-off spool	
	(Point 1). This run-off spool was equipped with a	
	slipping clutch. The nickel wire screen (Point,2),	
	which had a width of approximately 20 or 25 cm,	
	was slowly unrolled by the driving rollers (Points 8	
	and 9). The speeds of all rollers were synchronized.	
	While passing between the rollers (Point 3) and	
	rollers (Points 8 and 9), the wire screen passed over	
	a heated plate (Point 4), which was kept at a temperature which was above 200°C and below 400°C.	
	After passing over the heating plate, the wire screen	
	passed over an arrangement of jets (Point 9), from	
	which fine streams of nickel carbonyl and nitrogen	
	emerged. There were at least 20 jets. The distance	
	between the jets of the same row was roughly 10 mm.	
	The jet device moved in the direction indicated on the	
	sketch and with an amplitude equal to the interval	
	between the jets. There may also have been an added	
	elliptical movement. The frequency of the oscillation was below 50 cycles per second,	051/4
Г	The purpose of the movement was	25 X 1
L	to obtain uniformity of the sprayed layer.	
	or o	*
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ĺ	The jets in the spraying device	
	were externally cooled with water.	
101	The wire screen (Point 6), on which the nickel powder	
(2)	had been deposited by decomposition of the nickel	
	carbonyl, then passed through the rollers (Point 8 and	1.0
	9) and was wound on the collector roller (Point 5).	
(3)	If a sufficient quantity of nickel powder was not	
	deposited on the first run through the apparatus, it	
	was possible to send the roll of wire screen once	
	again through the entire process.	
(4)		25X1
` '/	The wire screen moved at a speed of about	
	one millimeter per second over the jet device, or	* ************************************
	about three meters per hour.	
/E1	The warrant did not warride for a sintender store	
(2)	The process did not provide for a sintering step. This was not thought to be required, but such a step	
	could easily be added to the process without loss to	
	the automatic character of the machinery.	
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(6)			20/1
	In some respects, the mechanical properties of this	١.	Ę.
	barrier material were superior to those of the Standard Thiessen Barrier. This was especially true of its		. 14
	ductility. The powder clung so hard to the wire screen that it would not fall off when the wire was vigorously	*	
	bent back and forth, whereas with the Standard Thiessen		
	Barrier such a procedure would leave a barewire screen.		25 X 1
(7)	this development was very		
,	promising, although no tubes had as yet been welded. Suddenly, the entire project was halted, with the		
	explanation that wire-screen material was in short supply. In spite of reports on this project,	Ĭ	
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	the Soviets never evinced interest in the project. Thiessen's role was somewhat		
	more ambiguous.		25X1
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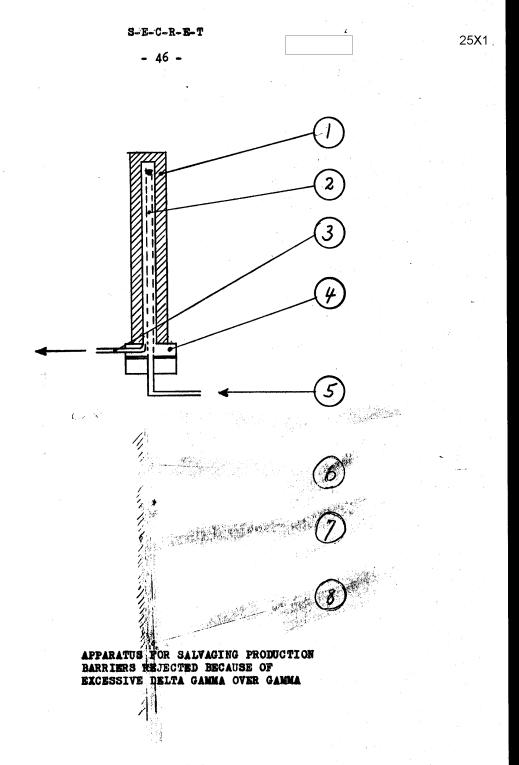
the Butterbrot barrier, sedimentation entails first a coarse powder layer on which a fine-grained powder layer is deposited. But less defined in the sedimentation process (a) because of the very thin coating and (b) because of the elementary magnetism of the nickel powder. Though this elementary magnetism is very small for nickel powder, it nevertheless causes the larger particles to carry along the small particles, so that the medium sized particles settle on the entire surface area. A few hundred barriers of this type were made. Burdiashvili had as many as 50 of the rectangular copper vessels in operation. It was found that the barriers were superior to the Thiessen sprayed barrier in respect to uniformity. the disadvantage of the Burdiashvili process was that the barrier was covered with nickel powder on only one side. This led to a lower stability of the barrier tube. The Burdiashvili barrier fully satisfied the technical requirements of the Soviets in respect to gamma and delta gamma over gamma. In fact, their delta gamma over gamma was better by about 0.5 percent, that is, 2.5 percent instead of three percent for the Standard Thiessen Barrier. The gamma value was around 1.0 x 10 ⁻³ .	See-C-R-E-T	25)
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The Burdiashvili barrier fully satisfied the technical requirements of the Soviets in respect to gamma and delta gamma over gamma. In fact, their delta gamma over gamma was better by about 0.5 percent, that is, 2.5 percent instead of three percent for the Standard Thiessen Barrier. The gamma value was around 1.0 x 10 3.	was found that the barriers were superior to the Thiessen sprayed barrier in respect to uniformity. the disadvantage of the Burdiashvili process was that the barrier was	2
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. 	of the Soviets in respect to gamma and delta gamma over gamma. In fact, their delta gamma over gamma was better by about 0.5	<u>27</u> /
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20	To the set of the description of the description	
70.	In the midst of the development work,	25X1
	that the screen material was not available, the experiments were halted. This sen had shown very little interest in this work, although the top Soviet administrative official in Sinop, Gen. Kochlavashvili, was supposed to have been interested. This sen might have feared the competi-	25X1
	tion of Burdiashvili and perhaps disparaged the work for not wholly disinterested motives,	
	In 1951, Burdiashvili was honored with a collective Stalin Prize, First Class. Thiessen,	25 X 1
	as well as two Soviets Trubnikov (fnu) and Olshevskiy (fnu), probably from Elektrostal, were also included in this collective Stalin Prize.	
		25X1
71.	After this project was discontinued, Burdiashvili worked on spraying processes with reduction powder and Monel powder. Towards the end of 1952, Burdiashvili left Sinop with Thiessen, and returned again in January 1955.	25 X
		25X1
	PROCESSES FOR SALVAGING PRODUCTION REJECT BARRIERS	
72.		25 X 1
	the problem of salvaging reject barriers	20/(1
	The problem consisted of taking finished production barriers with delta gamma over gamma or gamma values outside the range of the technical requirements and of devising measures which would bring the characteristics of these barriers into the specified range.	
73.	· · ·	
		25X1

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The	problem involved was to	wofold:		
a.		gamma over gamma value lower these delta gamma		
ъ.	Given tubes with gamma to raise these gamma v	values lower than the alues.	specified limit	
Love	ring Delta Gamma over (Gamma	2 1	
read by d rang	ing in excess of three ne large hole, it was ; e of the specification	barrier had a delta ga percent, and if this w possible to bring the b s by means of the appar	was not caused barrier into the	
appe	ars on page 46.		apparatus made	2
		The s	······································	
		rect decomposition of n		
the	of the principle of di barrier:			
the				25)
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S-E-C-R-E-T

25X1 S-E-C-R-E-T 339 - 47 a. Point 1 is an electrically heated oven insulated with asbestos, which was kept at a temperature higher than 200°C and lower than 350°C. Into this oven was placed the barrier (Point 2), which was plugged at one end. Point 3 is an exhaust tube, and Point 4 is a cooled flange. b. A mixture of nickel carbonyl and nitrogen entered the tube (Point 5). The mixture was at a pressure of 30 to 40 mm, and as it passed through the warmed diaphragm, the nickel carbonyl decomposed in the pores of the barrier. The control of pressure was important because of the rapid (quadruple) splitting-off of the CO molecules from the nickel carbonyl. no pressures in excess of 50 mm were used. 25X1 Experiments were also made at very low pressures; i.e., 10 mm or 20 mm. 25X1 76. The nickel carbonyl decomposed as a wedge-shaped layer with the thicker part at the bottom of the tube. It was, therefore, decided to rotate the barrier by 180 degrees in the middle of the operation. Thus, the end of the barrier which pointed upward during the first half of the operation was pointed downward during the last half of the operation. In this way, a fairly uniform layer of nickel powder was deposited on the surface. 25X1 77. As was expected, the larger part of the nickel carbonyl passed through the big pores; the smaller part passed through the smaller pores, thus reducing gamma and improving delta gamma over gamma. experiments showed that any barrier could be 25X1 brought into the required norm range if the excess delta gamma over gamma was not caused by a single hole or a few large holes. This treatment of the barrier only very slightly decreased the gamma value. 78. After successful experiments constructed another apparatus on the same principle but 25X1 capable of holding five or six or eight tubes at one time. This larger apparatus operated automatically; that is, the valves in the system were electromagnetically actuated and were controlled by an electric programming system. During this operation, a valve placed at the entrance was closed. When a definite pressure was obtained, a magnetic valve opened the entrance for a specified time to let in a specific volume of nickel-carbonyl and

S-E-C-R-E-T

nitrogen mixture. This volume was, of course, dependent on the concentration of the mixture. This cycling continued automatically for about one hour. A selector dial on the apparatus made it possible to select in advance the regimen desired; that is, the time the exhaust valve and the inlet valve were to be opened

could be programmed.

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S-E-C-R-E-T

81.

	S=E-C-R=E-T	25 X 1
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	5.	
•		25 X 1
82.		
	Increasing the Permeability of the Barrier	
₹ 3.		1 25X
	low gamma values was placed in a glass tube which served	
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		25 X 1
		25/1
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S-E-C-R-E-T

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as a so-called cooling jacket. The cooling jacket, in turn, was connected with a Hoeppler thermostat, which kept the temperature somewhere between 60°C and 80°C. The heating was not performed with radio frequency but was water heating.

b. At a place of negative pressure, carbon monoxide was introduced, which entered through the pores of the barrier tube. The nickel carbonyl, which was formed as result of the interaction, deposited on the bottom of the device. It was found that more of the gas streamed through the larger holes of the barrier tube, with the result that the larger pores became larger at a faster rate than the small pores of the barrier. This led to a rapid increase in the delta gamma over gamma value, far beyond the permitted specification range, while the gamma value increased relatively slowly.

84. The experiments were carried out shortly before Thiessen's departure from Sinop in late 1952.

Thiessen included it in

the inventory of equipment which accompanied him to Moscow.

INTRODUCTION OF STANDARD THIESSEN BARRIER INTO SOVIET PRODUCTION

Experimental Tsekh in Zavod 12, Elektrostal

85. In spring 1948, after the first zero series of 300 to 400 Standard Thiessen Barriers had been manufactured in Sinop,

25X1

25X1

While there,

the group was assigned to the Thiessen department and was instructed in all phases of the production of the Standard Thiessen Barrier.

86. In the beginning of June 1948, a group of German specialists from the Thiessen department in Sinop was sent to Zavod 12, Elektrostal.

25X1

Until the end of August 1948, they remained in Elektrostal and introduced the process for the manufacture of the Standard Thiessen Barrier.

Not all the Germans stayed for the eight weeks. It appears that Thiessen, Krecker, and Miss Schilling left before the end of August. Hartz, too, left earlier for Sinop, but returned again

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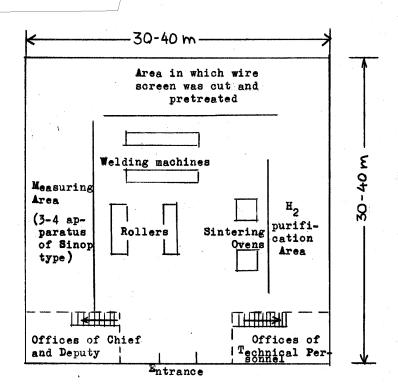
S=E-C-R-E-T

- 51 -

25X1

87. The Germans performed their work in a small building which served as an experimental plant. The official term for the building was tsekh.

25X1

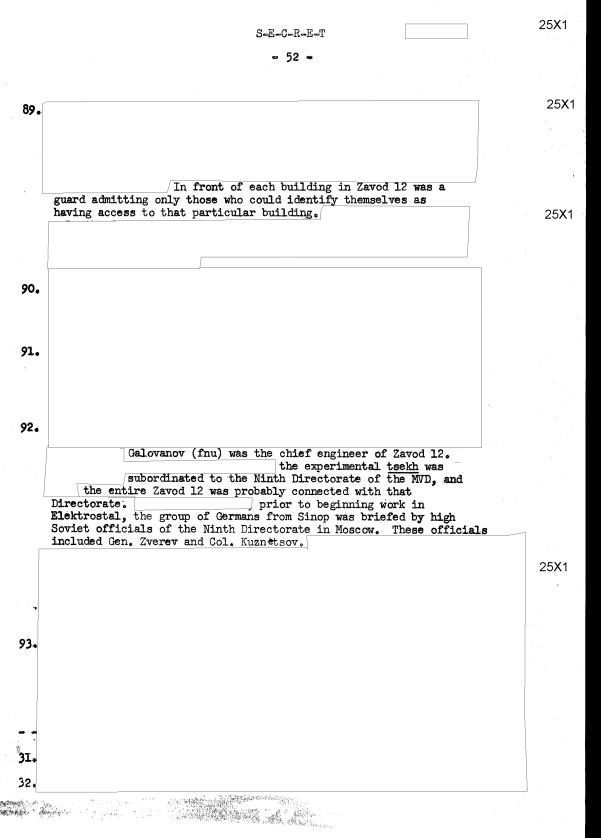


FLOORPLAN OF EXPERIMENTAL TSEKH, ELEKTROSTAL

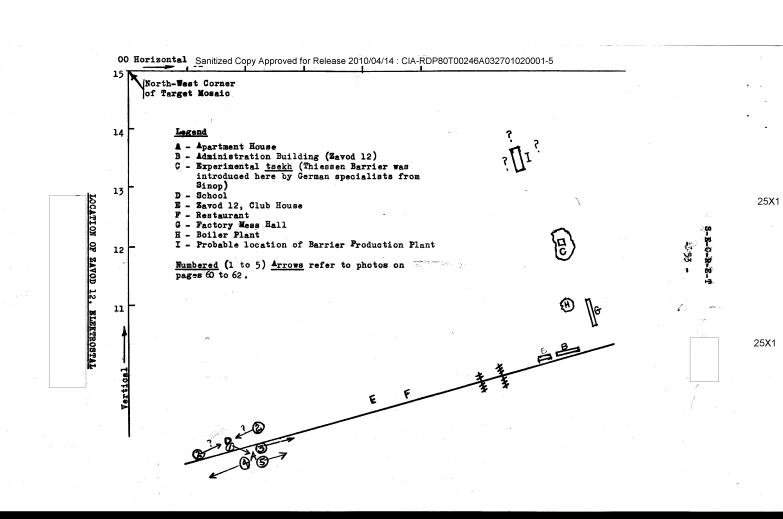
88. In the building was exactly the same type of equipment as that used in Sinop for the production of the Standard Thiessen Barrier except that the numbers of every machine or device was multiplied by a factor of four to six. The machinery, with the exception of the sintering ovens, had been built in Sinop.

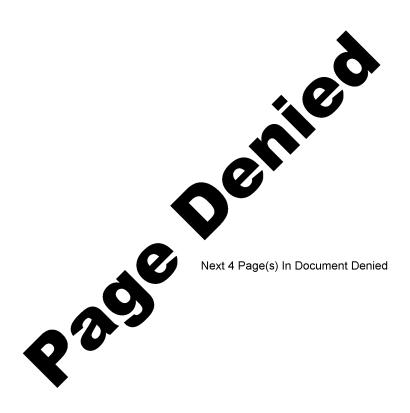
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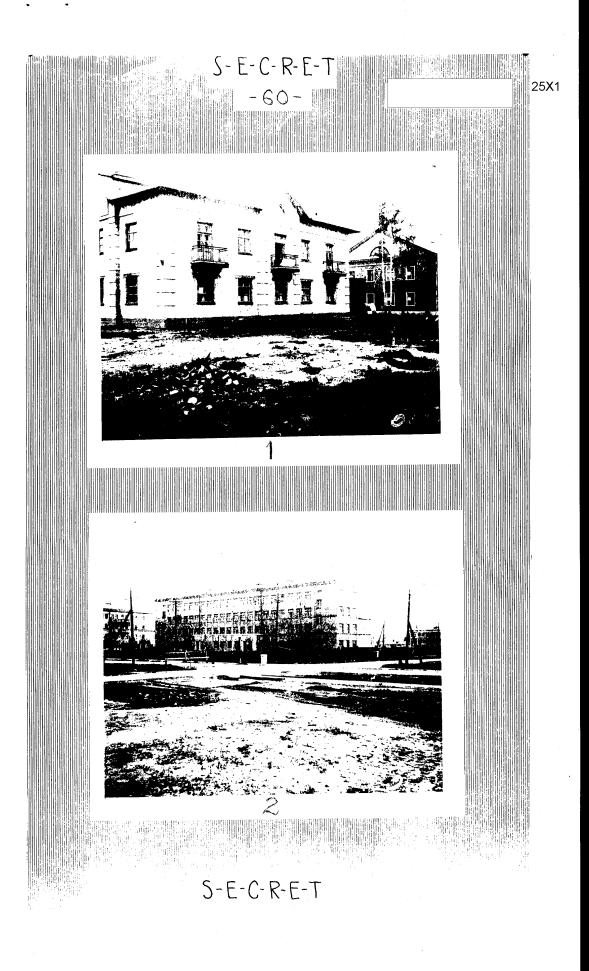
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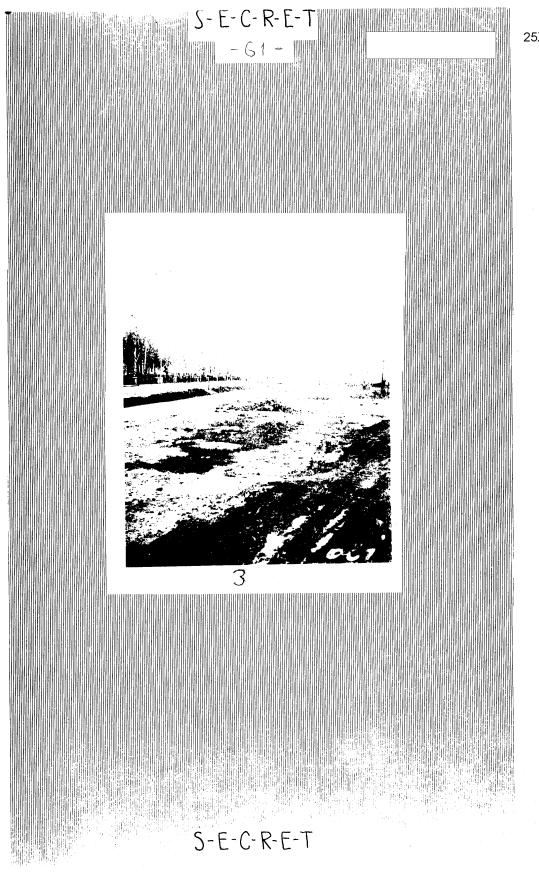


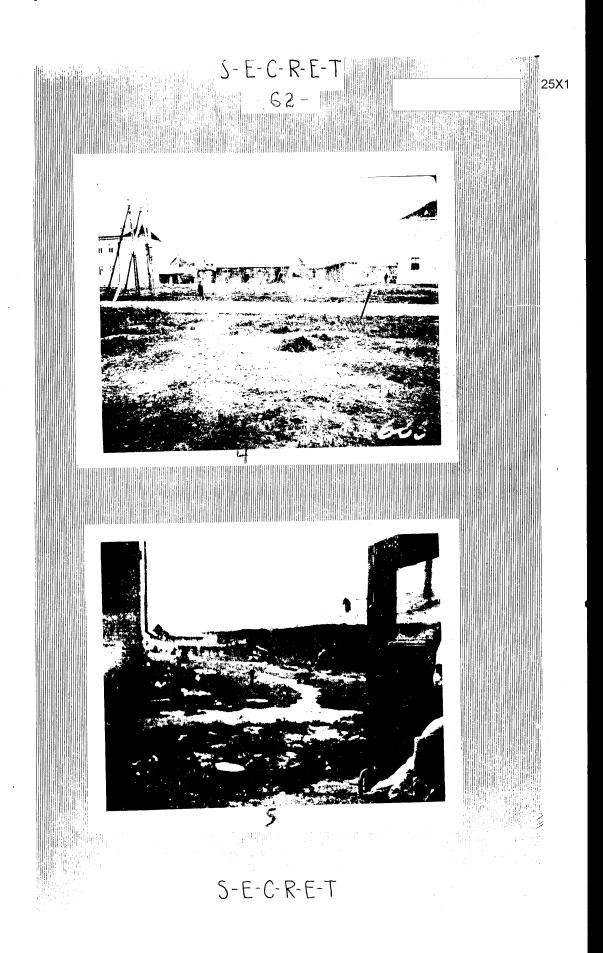


		S-E-C-R-E-T		25 X 1
		- 59 -		
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				25 X 1
				N.
	Photo 1:	Apartment house or guest house of Zavod 12 in which other German specialists from Sinop were housed during their 1948 assignment in Elektrostal.		25X1
	Photo 2:	A school in Elektrostal.		25X
				251
	Photo 3:	Ulitsa Karla Marksa. This asphalted street led east from the guest house (1) to Zavod 12.		
*1	Photo 4:	View west-southwest from guest house (1)		
	Photo 5:	View east from guest house (1).		
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Sanitized Copy Approved for Release 2010/04/14 : CIA-RDP80T00246A032701020001-5 , FORMATION INFORMA CENTRAL INTELLIGENCE AGENCY This material contains information affecting the National Defense of the United States within the meaning of the Espionage Laws. Title 18, U.S.C. Secs. 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law. C-O-N-F-T-D-E-N-T-T-A-T 25X1 PROCESSING COPY COUNTRY China REPORT **SUBJECT** Photographs of Chinese Communist Naval DATE DISTR. 15 March 1957 Vessels, Whangpoo River, Shanghai NO. PAGES 2 REQUIREMENT NO. 25X1 DATE OF INFO. REFERENCES 25X1 25X1 SOURCE EVALUATIONS ARE DEFINITIVE ADDRAISAL OF CONTENT IS TENTATIVE 1. A series of six consecutive photographs, of Chinese Communist naval vessels in the Whangpoo River, Shanghai The ships were berthed in the vicinity of the Asiatic Petroleum Company Lower Wharf and photographed from the angle indicated in the following overlay on CHINA KIANGSU SHANGHAI 31 14 N 121 28 E SKETCH MAP OF WHANGPOO RIVER PORT AREA. 25X1 Whangpoo River International Dock Asiatic Petroleum Co. (Lower Wharf) C-O-N-F-I-D-E-N-T-I-25X1 STATE EV X AIR X NAVY AEC (Note: Washington distribution indicated by "X"; Field distribution by "#".) ONREPORT INFORMATION

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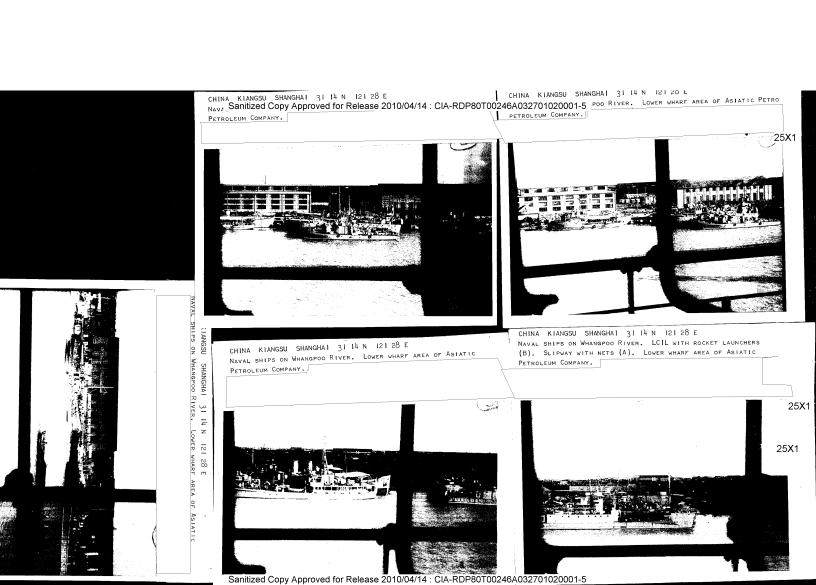
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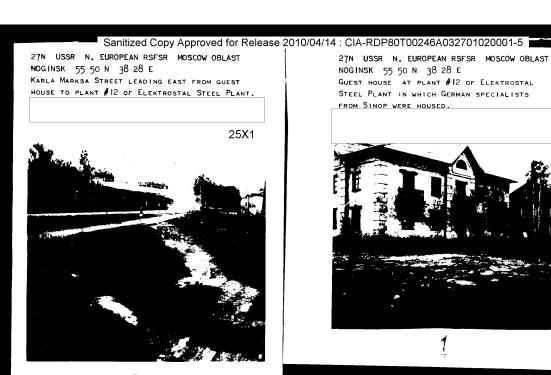
- a. Area photographed.
- b. Position of Observer.
- c. Buoy No. 20.
- 3. The vessels photographed include a variety of district patrol craft (YP) motor gunboats (PCM), a possible river gunboat (PR), one LCIL along with other landing ships of the same or of a different type, and other vessels.
 - In Photograph 6, which shows an LCIL with other landing ships docked inshore of her, the following objects are indicated:
 - a. A slipway, covered with nets. No cranes were seen in this area. Chinese naval personnel were observed in the immediate vicinity.
 - b. Two, possibly four, tubular objects, which appear to be mounted on chassis, on the foredeck of the LCIL.

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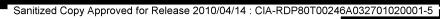
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ELFMTROSTAL STEEL

27N US. N. EUROP: RSFSR MOSCOW OBLAST NOGINSK 5 TO N 38 20 LOOKING WEST-C THWEST FROM GULDT MOUSE OF



27N USSR N. EUROPEAN RSFSR MOSCOW OBLAST NOGINSK 55 50 N 38 28 E LOOKING EAST FROM QUEST HOUSE OF ELEKTROSTAL

STEEL PLANT.



